```
     FILE 'REGISTRY' ENTERED AT 13:39:07 ON 15 AUG 2002
L1            1 S GOLD/CN
L2            1 S TIN/CN
L3            4 S (PLATINUM OR IRON OR COBALT OR NICKEL)/CN

     FILE 'HCAPLUS' ENTERED AT 13:40:01 ON 15 AUG 2002
L4        10864 S OPTOELECTRONIC? OR OPTO()ELECTRONIC?
L5         2861 S (H01L-027/14 OR H03K-019/14)/IC
L6          281 S (INTERMETALLIC OR INTER()METALLIC)(2N)(SOLDER OR SOLDERING OR
L7        18046 S (GOLD OR AU) AND (TIN OR SN)
L8      2289237 S PLATINUM OR PT OR IRON OR FE OR COBALT OR CO OR NICKEL OR NI
L9       815128 S KINETIC?
L10          32 S BINARY(2N)(SOLDER OR SOLDERING OR SOLDERED OR BRAZE?)
L11          56 S (SOLDER OR SOLDERING OR SOLDERED OR BRAZE?)(2N)(QUENCH?)
L12        5965 S WET####(1N)(LAYER? OR FILM OR COAT####)
L13        8826 S ANTI()OXIDAT? OR ANTIOXIDAT?
L14           1 S (L4 OR L5) AND L6
L15          66 S (L4 OR L5) AND L7
L16          29 S L15 AND L8
L17          19 S (L4 OR L5) AND (L1 AND L2)
L18          10 S L17 AND L3
L19          30 S L16 OR L18
L20           3 S BINARY(2N)BRAZ?
L21          15 S (L10 OR L11) AND EUTECTIC?
L22          15 S L21 NOT (L19 OR L20)
L23           8 S (L10 OR L11) AND L7
L24           1 S (L10 OR L11) AND (L1 AND L2)
L25           5 S (L23 OR L24) NOT (L19 OR L20 OR L21)
L26       67745 S SOLDER OR SOLDERING OR SOLDERED OR BRAZ?
L27         610 S L26 AND L9
L28          11 S L27 AND BINARY
L29          11 S L28 NOT (L19 OR L20 OR L21 OR L23 OR L24)
L30          40 S L27 AND L7
L31         180 S L27 AND L8
L32          73 S L27 AND (L1 OR L2)
L33          96 S L27 AND L3
L34          81 S L30 OR L32
L35          93 S L31 AND L33
L36          38 S (L34 OR L35) AND EUTECTIC
L37          38 S L36 NOT (L19 OR L20 OR L21 OR L23 OR L24 OR L28)
L38           4 S (L34 OR L35) AND L12
L39           0 S (L34 OR L35) AND L13
L40          11 S (L34 OR L35) AND TERNARY
L41           4 S L40 NOT (L19 OR L20 OR L21 OR L23 OR L24 OR L28 OR L36)
```

L14 ANSWER 1 OF 1 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:351178 HCAPLUS
DN 133:8000
TI Kinetically controlled solder bonding based on intermetallic compounds formed from interlayers, and suitable for sequential bonding in microelectric apparatus
IN Angst, David L.; Auker, Brian Stauffer; Coult, David Gerald; Derkits, Gustuv Edward Jr.; Osenbach, John William
PA Lucent Technologies Inc., USA
SO Eur. Pat. Appl., 10 pp.
CODEN: EPXXDW
DT Patent
LA English
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 1002612	A1	20000524	EP 1999-308915	19991109
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
	US 6342442	B1	20020129	US 1998-197074	19981120
	JP 2000210767	A2	20000802	JP 1999-331303	19991122
	US 2002045330	A1	20020418	US 2001-21174	20011029
PRAI	US 1998-197074	A	19981120		

AB The multilayered assembly for kinetically controlled bonding includes the sep. interlayers of the 1st and 2nd metals for an intermetallic compd. formed by contact reaction in heating to the lowest m.p., and reacting to stabilize the intermetallic compd. for higher service temp. The process can be modified for use with a ternary intermetallic compd. and 2-stage soldering or brazing, esp. with the ternary **intermetallic solder** contg. Au and Sn with Pt, Fe, Co, or Ni. The parts precoated for soldering can be stored before assembly with the reactive interlayer contacts. The parts are heated from a storage temp. to the bonding temp. slightly above the lowest m.p. of the component interlayer, resulting in the formation of solid intermetallic compd. for stable bonding. The typical intermetallic compd. for the ternary solder is $AuPt_2Sn_4$ formed from the Au-Sn-Pt system, and requiring the metal interlayers with only 0.25 Au as the wetting layer, and 5 Pt as the oxidn.-resistant layer for 1 wt. part of Sn.
RE.CNT 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

```
L19  ANSWER 1 OF 30  HCAPLUS  COPYRIGHT 2002 ACS
AN   2002:466457  HCAPLUS
DN   137:26007
TI   One-chip micro-integrated optoelectronic sensor
IN   Starikov, David; Berishev, Igor; Bensaoula, Abdelhak
PA   USA
SO   U.S. Pat. Appl. Publ., 23 pp.
     CODEN: USXXCO
DT   Patent
LA   English
FAN.CNT 1
     PATENT NO.        KIND  DATE          APPLICATION NO.  DATE
     ---------------   ----  --------      ---------------  --------
PI   US 2002074553      A1   20020620      US 2000-738728   20001215
AB   This disclosure describes 1-chip micro-integrated optoelectronic
     sensors contg. both a light source and a detector on a single chip and
     methods for fabricating and using the same.  The sensors may include an
     optical emission source, optical filter and a photodetector fabricated on
     the same transparent substrate using the same technol. processes.  Optical
     emission may occur when a bias voltage is applied across a
     metal-insulator-semiconductor Schottky contact or a p-n junction.  The
     photodetector may be a Schottky contact or a p-n junction in a
     semiconductor.  Some sensors can be fabricated on optically transparent
     substrate and employ back-side illumination.  In the other sensors
     provided, the substrate is not transparent and emission occurs from the
     edge of a p-n junction or through a transparent electrode.  The sensors
     may be used to measure optical absorption, optical reflection, scattering
     or fluorescence.  The sensors may be fabricated and operated to provide a
     selected spectrum of light emitted and a multi-quantum well
     heterostructure may be fabricated to filter light reaching the
     photodetector.

L19  ANSWER 2 OF 30  HCAPLUS  COPYRIGHT 2002 ACS
AN   2002:429010  HCAPLUS
DN   137:13068
TI   Particles with opalescent effect
IN   Fu, Guoyi; Lewis, Diane
PA   Merck Patent Gmbh, Germany
SO   PCT Int. Appl., 22 pp.
     CODEN: PIXXD2
DT   Patent
LA   English
FAN.CNT 1
     PATENT NO.        KIND  DATE          APPLICATION NO.  DATE
     ---------------   ----  --------      ---------------  --------
PI   WO 2002044301      A2   20020606      WO 2001-EP12788  20011105
         W:  AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN,
             CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
             GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
             LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL,
             PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG,
             US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
        RW:  GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY,
             DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF,
             BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG
PRAI US 2000-253932P    P    20001130
AB   Particles with opalescent effect, esp. three-dimensional structural color
     pigments, are described which comprise a sphere based crystal structure or
```

superlattice built up by monodisperse spheres and .gtoreq.1 secondary types of much smaller colloidal particles occupying partially or completely the empty spaces between the monodisperse spheres. Methods of producing the particles are described which entail the use of coating processes. Use of the particles for photonic and **optoelectronic** device applications is also described.

```
L19  ANSWER 3 OF 30  HCAPLUS  COPYRIGHT 2002 ACS
AN   2002:294018  HCAPLUS
DN   136:316725
TI   An optoelectronic device having multifunctional pixels
IN   Underwood, Ian; Gourlay, James
PA   Microemissive Displays Limited, UK
SO   PCT Int. Appl., 23 pp.
     CODEN: PIXXD2
DT   Patent
LA   English
FAN.CNT 1
     PATENT NO.        KIND  DATE          APPLICATION NO.  DATE
     ---------------   ----  --------      ---------------  --------
PI   WO 2002031882      A1   20020418      WO 2001-GB4505   20011010
         W:  JP, US
         RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL,
             PT, SE, TR
PRAI GB 2000-24804      A    20001010
AB   An optoelectronic device is described comprising a semiconductor
     substrate (e.g., Si layer) providing active circuitry, and an array of
     smart pixels, each smart pixel comprising part of the active circuitry as
     well as at least one org. layer which performs at least one of the
     functions of light detection, light emission, light modulation and light
     amplification, wherein the smart pixels comprise conversion means capable
     of converting optical signals into elec. signals.  A method of fabricating
     the optoelectronic device is also described.
RE.CNT  6      THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD
               ALL CITATIONS AVAILABLE IN THE RE FORMAT


=> D BIB AB 4-30

L19  ANSWER 4 OF 30  HCAPLUS  COPYRIGHT 2002 ACS
AN   2001:830703  HCAPLUS
DN   135:347661
TI   Au-Sn-Ga alloys for creep-resistant solder fro
     opto-electronic applications
IN   Jin, Sungho; Kammlott, Guenther Wilhelm; Mavoori, Hareesh
PA   Lucent Technologies Inc., USA
SO   Eur. Pat. Appl., 16 pp.
     CODEN: EPXXDW
DT   Patent
LA   English
FAN.CNT 1
     PATENT NO.        KIND  DATE          APPLICATION NO.  DATE
     ---------------   ----  --------      ---------------  --------
PI   EP 1153698         A1   20011114      EP 2000-309571   20001030
         R:  AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,
             IE, SI, LT, LV, FI, RO
     US 6403233         B1   20020611      US 2000-548574   20000413
     JP 2002001576      A2   20020108      JP 2001-114693   20010413
PRAI US 2000-548574     A    20000413
```

AB The solder compns. exhibit a desired combination of high creep resistance at typical operating temps. and low stress in formed solder joints. The solders contain **gold** 82-85, **tin** 12-14, and gallium 3-4 wt.%, and optionally, other elements such as Cu, In, Bi, Ag, Pb, Sb, or **Ni** .ltoreq.2 wt.%. The small amt. of added Ga induces a significant depression in the liquidus temps. of both **Au** and **Sn**, and thus a depressed m.p. (.apprx.27.degree. less than eutectic **Au-Sn** solder), and also provides an enhanced temp.-sensitivity of the solder's creep resistance. The solder exhibit a creep strain of 5-50% lower than the std. alloy 80Au-20Sn. A variety of electronic, **optoelectronic** and optical device structures are capable of being formed using the solder. For example, in addn. to bonding of optical fibers, bonding of a variety of other components such as planar waveguides (typically silica or phosphate glass), optical lenses, and heat-spreaders such as BeO (used in laser packages) are possible, generally with a suitable metalization scheme, e.g., Ti/**Pt/Au** or Cr/Cu/**Au**.

RE.CNT 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 5 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:795014 HCAPLUS
DN 135:310723
TI Transparent substrates for **optoelectronics**
IN Zenker, Thomas; Thiemann, Christian
PA Schott Interactive Glass G.m.b.H., Germany; Schott Glas
SO Ger. Offen., 10 pp.
CODEN: GWXXBX
DT Patent
LA German
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 10019888	A1	20011031	DE 2000-10019888	20000420

AB The invention concerns a substrate for **optoelectronic** units, in particular light sources, which are applied to the surface of the substrate, also a transparent substrate and a conductive layer applied on the transparent substrate. The invention is marked by the subsequent characteristic: The conductive layer is transparent or quasi transparent and arbitrarily structurable in the visible wavelength coverage.

L19 ANSWER 6 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:784359 HCAPLUS
DN 136:61180
TI Infrared transparent conductive oxides
AU Johnson, Linda F.; Moran, Mark B.
CS Weapons Division, Code 4T4110D, Naval Air Warfare Center, China Lake, CA, 93555, USA
SO Proceedings of SPIE-The International Society for Optical Engineering (2001), 4375(Window and Dome Technologies and Materials VII), 289-299
CODEN: PSISDG; ISSN: 0277-786X
PB SPIE-The International Society for Optical Engineering
DT Journal
LA English
AB A novel class of complex metal oxides that have potential as transparent conducting oxides (TCOs) for the electromagnetic-interference (EMI) shielding on IR-seeker windows and missile domes was identified. These complex metal oxides exhibit the rhombohedral (R3m) cryst. structure of naturally occurring delafossite, $CuFeO_2$. The general chem. formula is

ABO2 where A is a monovalent metal (Me+1) such as Cu, Ag, **Au**, **Pt** or Pd, and B is a trivalent metal (Me3+) such as Al,Ti,Cr, **Co**,**Fe**,**Ni**,Cs,Rh,Ga,**Sn**
,In,Y,La,Pr,Nd,Sm or Eu. By adjusting the O content, the cond. can be varied over a wide range so that the delafossites behave as insulators, semiconductors or metals. This paper presents results for films of p-type CuxAlyOz and n-type CuxCryOz deposited by reactive magnetron **co**
-sputtering from high-purity-metal targets. Films were deposited using conventional RF- and DC-power supplies, and a new asym.-bipolar-pulsed-DC-power supply. Similar to the high-temp.-Cu- oxide superconductors, the presence of Cu-O bonds is crit. for the unique properties. FTIR and electron spectroscopy for chem. anal. (ESCA) were used to understand the relation between the **optoelectronic** properties and the mol. structure of the films. For example, FTIR absorption bands at 1470 and 1395cm-1 are present only in CuxAlyOz films that exhibit enhanced elec. cond. When these bands are absent, the CuxAlyOz films have high values of resistivity. In addn. to the 1470 and 1395 cm-1 bands obsd. in CuxAlyOz films, another pair of bands at 1040 and 970 cm-1 is present in CuxCryOz films.

RE.CNT 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 7 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:711956 HCAPLUS
DN 136:13504
TI Pulsed electrodeposition of the eutectic **Au/Sn** solder for **optoelectronic** packaging
AU Djurfors, B.; Ivey, D. G.
CS Department of Chemical and Materials Engineering, University of Alberta, Edmonton, AB, T6G 2G6, Can.
SO Journal of Electronic Materials (2001), 30(9), 1249-1254
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB As an alternative to the time-consuming solder pastes and preforms currently being used, a method of electroplating the eutectic **Au**
/Sn alloy has been developed. Using a pulsed **co**
-deposition process, it is possible to plate the solder directly onto a wafer at or near the eutectic compn. from a single soln. It has been shown that two distinct phases, Au5Sn and AuSn, can be deposited sep. over a range of current densities at compns. of 15 at.%**Sn** and 50 at.%
Sn, resp. By adjusting the deposition current pulse, it is possible to plate both phases in a layered composite thereby achieving any desired compn. between 15 and 50 at.%**Sn**, including the com. important eutectic compn.

RE.CNT 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 8 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:187311 HCAPLUS
DN 134:259914
TI Microstructural study of **co**-electroplated **Au/**
Sn alloys
AU Sun, W.; Ivey, D. G.
CS Department of Chemical and Materials Engineering, University of Alberta, Edmonton, AB, T6G 2G6, Can.
SO Journal of Materials Science (2001), 36(3), 757-766
CODEN: JMTSAS; ISSN: 0022-2461

```
PB     Kluwer Academic Publishers
DT     Journal
LA     English
AB     Au-Sn eutectic solder (20% Sn), because of
       its excellent mech. and thermal properties, is used for flip chip and
       laser bonding in optoelectronic applications.  Coelectroplating
       of Au and Sn was studied as an alternative to
       conventional methods for depositing Au/Sn alloys.
       Pulse current (PC) and d.c. plating tests were performed and compared
       using a suitably stable plating soln.  Plating conditions, including c.d.
       and on-off times (for PC plating), were varied to optimize the process.
       Reproducibility tests also were performed.  A range of alloy compns. can
       be deposited, including eutectic and near-eutectic compns., with
       compositional and microstructural uniformity potentially suitable for
       microelectronic and optoelectronic solder applications.
RE.CNT  21     THERE ARE 21 CITED REFERENCES AVAILABLE FOR THIS RECORD
               ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19    ANSWER 9 OF 30  HCAPLUS  COPYRIGHT 2002 ACS
AN     2001:186063  HCAPLUS
DN     134:201658
TI     Strongly textured atomic ridges and dots in a MOSFET device
IN     Kendall, Don; Guttag, Mark
PA     Starmega Corporation, USA
SO     PCT Int. Appl., 69 pp.
       CODEN: PIXXD2
DT     Patent
LA     English
FAN.CNT 1
       PATENT NO.        KIND  DATE          APPLICATION NO.  DATE
       ---------------   ----  --------      ---------------  --------
PI     WO 2001018866      A1   20010315      WO 2000-US24815  20000908
           W:  AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN,
               CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR,
               HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT,
               LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU,
               SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU,
               ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
           RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY,
               DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ,
               CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG
       US 6413880         B1   20020702      US 2000-657533   20000908
       EP 1221179         A1   20020710      EP 2000-966708   20000908
           R:  AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,
               IE, SI, LT, LV, FI, RO, MK, CY, AL
PRAI   US 1999-153088P    P    19990910
       WO 2000-US24815    W    20000908
AB     The present invention provides a MOSFET device comprising: a substrate
       including a plurality of at. ridges, each of the at. ridges including a
       semiconductor layer comprising Si and a dielec. layer comprising a Si
       compd.; a plurality nanogrooves between the at. ridges; .gtoreq.1
       elongated mol. located in .gtoreq.1 of the nanogrooves; a porous gate
       layer located on top of the plurality of at. ridges.  The present
       invention also provides a membrane comprising: a substrate; and a
       plurality of nanowindows in the substrate and a method for forming
       nanowindows in a substrate.  The present invention also provides a
       multi-tip array device comprising: a substrate; a multi-tip array of at.
       tips on the substrate, the multi-tip array having a pitch of 0.94-5.4 nm
       between adjacent tips in .gtoreq.1 direction; and means for moving the
```

substrate. The present invention also provides an at. claw comprising: a mounting block; a paddle having a multi-tip array thereon, the multi-tip array having a pitch of 0.94-5.4 nm between adjacent tips in .gtoreq.1 direction; and a cantilever connected to the paddle and the mounting block, in which the cantilever allows the paddle to be moved in .gtoreq.1 arcuate direction.

RE.CNT 2 THERE ARE 2 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 10 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:357061 HCAPLUS
DN 132:340989
TI Resistant change type infrared radiation sensors
IN Yamadera, Hideya; Fujizuka, Tokuo; Mizuno, Kentaro; Funabashi, Hirofumi; Sakata, Jiro
PA Toyota Central Research and Development Laboratories, Inc., Japan
SO Jpn. Kokai Tokkyo Koho, 5 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2000146685	A2	20000526	JP 1998-343618	19981117

AB The sensors comprise: a Si substrate; an air gap array; a SiO2 supporting layer (.apprx.350 nm thick) by CVD; a Ti/**TiN** multilayer circuit layer; a **Ni** (or a **Co**) resistance layer (.apprx.100 nm) by sputtering; a SiO2 protective layer; and a black **Au** IR light absorber layer.

L19 ANSWER 11 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:351178 HCAPLUS
DN 133:8000
TI Kinetically controlled solder bonding based on intermetallic compounds formed from interlayers, and suitable for sequential bonding in microelectric apparatus
IN Angst, David L.; Auker, Brian Stauffer; Coult, David Gerald; Derkits, Gustuv Edward Jr.; Osenbach, John William
PA Lucent Technologies Inc., USA
SO Eur. Pat. Appl., 10 pp.
CODEN: EPXXDW
DT Patent
LA English
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 1002612	A1	20000524	EP 1999-308915	19991109
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
	US 6342442	B1	20020129	US 1998-197074	19981120
	JP 2000210767	A2	20000802	JP 1999-331303	19991122
	US 2002045330	A1	20020418	US 2001-21174	20011029
PRAI	US 1998-197074	A	19981120		

AB The multilayered assembly for kinetically controlled bonding includes the sep. interlayers of the 1st and 2nd metals for an intermetallic compd. formed by contact reaction in heating to the lowest m.p., and reacting to stabilize the intermetallic compd. for higher service temp. The process can be modified for use with a ternary intermetallic compd. and 2-stage soldering or brazing, esp. with the ternary intermetallic solder contg.

Au and **Sn** with **Pt**, **Fe**, **Co**,
or **Ni**. The parts precoated for soldering can be stored before assembly with the reactive interlayer contacts. The parts are heated from a storage temp. to the bonding temp. slightly above the lowest m.p. of the component interlayer, resulting in the formation of solid intermetallic compd. for stable bonding. The typical intermetallic compd. for the ternary solder is AuPt2Sn4 formed from the **Au**-**Sn**-
Pt system, and requiring the metal interlayers with only 0.25
Au as the wetting layer, and 5 **Pt** as the
oxidn.-resistant layer for 1 wt. part of **Sn**.

RE.CNT 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 12 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:124871 HCAPLUS
DN 132:254302
TI **Co**-deposition of **Au**-**Sn** eutectic solder using pulsed current electroplating
AU Doesburg, J.; Ivey, D. G.
CS Department of Chemical and Materials Engineering, University of Alberta, Edmonton, AB, T6G 2G6, Can.
SO Proceedings - Electrochemical Society (1999), 99-9(Electrochemical Processing in ULSI Fabrication and Semiconductor/Metal Deposition II), 329-339
CODEN: PESODO; ISSN: 0161-6374
PB Electrochemical Society
DT Journal
LA English
AB Pulsed-current electrodeposits of **Au**-**Sn** alloy 1-5 .mu.m thick were formed on InP wafer precoated with Ti 25 nm and **Au** 250 nm thick. The electroplating soln. contained ammonium citrate 200, AuKCl4 5, SnCl2.2H2O 2-5, Na2SO3 60, L-ascorbic acid 15 g/L, and ethylene diamine (EDA) 0.01-0.11M. The effects of EDA and SnCl2 concns. on the alloy deposit structure were obsd. using SEM and X-ray diffraction. The addn. of 0.01-0.06M EDA to the electroplating soln. increased the deposition rate, and resulted in a coarser grain structure. The EDA content of 0.11M was detrimental to **Au**-**Sn** alloy deposition. Decreasing the **Sn** content in the soln. resulted in a lower **Sn** content in the alloy deposit. Increasing the av. c.d. to >2.4 mA/cm2 resulted in the loss of preferred orientation in the electroplate deposit. The **Au**-30 at.% **Sn** eutectic solder is suitable for **optoelectronic** applications, esp. for joining of InP devices to the CVD-diamond coated substrates in a flip-chip assembly.

RE.CNT 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 13 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1999:680333 HCAPLUS
DN 132:7906
TI Achievement of homogeneous AuSn solder by pulsed laser-assisted deposition
AU Belouet, C.; Villard, C.; Fages, C.; Keller, D.
CS Etablissement de Marcoussis, Alcatel CIT, Marcoussis, F-91461, Fr.
SO Journal of Electronic Materials (1999), 28(10), 1123-1126
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB The deposition of AuSn solder at the eutectic compn. (80 wt.% **Au**

, 20 wt.% **Sn**) on a wetted, chem. inert metallic barrier has been studied in relation to its use in **optoelectronic** packaging. The bonding structure, consisting of a W barrier, the top part of which is doped with **Ni** (or Ti) to provide wetting by molten AuSn, and the homogeneous 80-20 AuSn solder several micrometers thick, has been grown by the Pulsed Laser-assisted Deposition (PLD) technique on 2" silicon wafers. The compn. of the AuSn layer was controlled within better than 1 wt.% as probed by EDX across the wafer diam. The molten solder exhibited good wetting properties on the W modified layer and the whole structure was found to be chem. stable against thermal cycling at 320.degree. for over 3 min. The use of molten AuSn targets makes the PLD technique a most competitive one for the achievement of high quality and reliable AuSn solder.

RE.CNT 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 14 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1999:384210 HCAPLUS
DN 131:136540
TI Indium **tin** oxide contacts to gallium nitride **optoelectronic** devices
AU Margalith, T.; Buchinsky, O.; Cohen, D. A.; Abare, A. C.; Hansen, M.; DenBaars, S. P.; Coldren, L. A.
CS Department of Electrical and Computer Engineering, University of California, Santa Barbara, CA, 93106, USA
SO Applied Physics Letters (1999), 74(26), 3930-3932
CODEN: APPLAB; ISSN: 0003-6951
PB American Institute of Physics
DT Journal
LA English
AB The authors have fabricated GaN-based light-emitting diodes using transparent In **Sn** oxide (ITO) p contacts. ITO-contacted devices required an addnl. 2 V to drive 10 mA, as compared to similar devices with metal contacts. However, ITO has lower optical absorption at 420 nm (.alpha. 664.cm-1) than commonly used thin metal films (.alpha. 3..times. 105 cm-1). Uniform luminescence was obsd. in ITO-contacted devices, indicating effective hole injection and current spreading.
RE.CNT 14 THERE ARE 14 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 15 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1999:165487 HCAPLUS
DN 130:273309
TI Low cost/high volume laser modules using silicon optical bench technology
AU Osenbach, J. W.; Dautartas, M. F.; Pitman, E.; Nijander, C.; Brady, M.; Schlenker, R. K.; Butrie, T.; Scrak, S. P.; Auker, B. S.; Kern, D.; Salko, S.; Rinaudo, D.; Whitcraft, C.; Dormer, J. F.
CS Lucent Technologies, Bell Laboratories, Breinigsville, PA, USA
SO Proceedings - Electronic Components & Technology Conference (1998), 48th, 581-587
CODEN: PETCES
PB Institute of Electrical and Electronics Engineers
DT Journal; General Review
LA English
AB A review with 8 refs. As the information age continues to expand, there is a considerable need for low cost/ high vol., reliable **optoelectronic** modules. Because of the potential cost savings, Si optical bench technol. (SiOB) has emerged as one of the leading enabling technol. candidates needed for the com. realization of such modules. As a

result, over the past 3 to 5 yr, there was a significant no. of papers published on the use of SiOB for low cost **optoelectronic** modules. The authors report on the use of SiOB technol. used in the prodn. of low cost/high vol., reliable laser modules. The SiOB platform is designed for manufacturability, reduced parts count, reduced process steps, and ability to accept design changes to respond to a rapidly changing marketplace. For example, this SiOB technol. was used for at least 4 different laser designs/types without significant changes in the SiOB manufg., optical subassembly, or package assembly process. The SiOB technol. is the 1st of its kind in that it integrates: (i) Si micromachining for the lens holder cavities and back face monitor turning mirror, (ii) Ti/**Pt**/**Au** for interconnect metalization and photodiode bonding, (iii) Al for AlO bonding attachment of the lens, and (iv) **Au**/**Sn** solder for laser attachment. The laser and photodiode are passively aligned using a visual alignment system and fiducials on the Si. The lens is self-aligned to the Si during the AlO bonding process. Because the authors use AlO bonding for lens attachment and solder bonding for laser and photodiode attachment, this optical subassembly (OSA) contains no org. materials. Following the discussion on the OSA assembly technol., the authors discuss the assembly technol. used to produce low cost uncooled laser modules and the performance of these modules. As was the case for OSA assembly, no org. adhesives are used in the hermetic enclosure of the laser module assembly. Finally, the authors present the reliability data for the module. The reliability data indicate that the optical alignment of these modules is extremely stable. The authors observe essentially no change in optical coupling as a result of extended storage at 85C, extended temp. cycling between -40C and +85C, or extended storage at 40C/95%RH. To knowledge, this is the 1st high vol./low cost, highly reliable edge emitting laser module that extensively uses SiOB technol. and design for manuf. principles.

RE.CNT 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 16 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1998:588043 HCAPLUS
DN 129:324300
TI Microstructural characterization of **Au**/**Sn** solder for packaging in **optoelectronic** applications
AU Ivey, D. G.
CS Department of Chemical and Materials Engineering, University of Alberta, Edmonton, AB, T6G 2G6, Can.
SO Micron (1998), 29(4), 281-287
CODEN: MCONEN; ISSN: 0968-4328
PB Elsevier Science Ltd.
DT Journal
LA English
AB Preliminary results on the feasibility of using coevapn. of eutectic **Au**/**Sn** solder for semiconductor packaging are presented. **Au** is electron beam evapd., while **Sn** is thermally evapd., onto Ti/**Pt**/**Au** metalized InP substrates. Electron microscopy was used to det. the compn. and uniformity of the solder and to characterize interfacial reactions between the solder and the semiconductor metalization. Eutectic **Au**/**Sn** solder, several microns thick, can be deposited with intermittent substrate cooling. Heating of the solder during simulated reflow expts. results in dissoln. of **Au** and **Pt** into the solder, with **Pt** going into substitutional solid soln. in AuSn. Part of the Ti layer is consumed as well, forming Au4Ti contg. **Sn**. Bonding tests, reveal solder joints with a uniform distribution of small pores,

significantly <1 .mu.m in size.

L19 ANSWER 17 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1998:562234 HCAPLUS
DN 129:233999
TI First investigations of **Au/Sn** alloys on different end-metalizations
AU Anhock, S.; Oppermann, H.; Kallmayer, C.; Aschenbrenner, R.; Thomas, L.; Reichl, H.
CS Berlin, Germany
SO DVS-Berichte (1998), 191(EuPac '98), 43-46
CODEN: DVSBA3; ISSN: 0418-9639
PB Verlag fuer Schweissen und Verwandte Verfahren DVS-Verlag
DT Journal
LA English
AB **Au/Sn** solder is constantly becoming more important in the field of microelectronic packaging. Esp. for high temp. and fluxless applications, for example in **optoelectronics Au/Sn** solder bumps are used. The **Au/Sn** solders come in contact with different end-metalization systems such as **nickel**, **platinum** or palladium used as pad-metalization. Information about the ternary systems **Au-Ni-Sn**, **Au**-Pd-**Sn** and **Au-Pt-Sn** as a metallurgical fundamentals are important for understanding and controlling the technol. processes. This knowledge is the base for investigations on reliability, phase formations, growth and stability, diffusion mechanisms and diffusion path ways. This paper summarizes the work done on different **Au-Ni-Sn**-, **Au**-Pd-**Sn**- and **Au-Pt-Sn** alloys with max. 20 at.-% **Ni**, Pd and **Pt** contents and investigations on diffusion and interface reactions of **Au/Sn** solders on **Ni**, Pd and **Pt**. Isothermal sections of the solid state are introduced. The presence of unknown **Au-Ni-Sn**- and **Au**-Pd-**Sn**-phases in the tie-triangle is discussed. Results of diffusion investigations and interface reactions are shown.

L19 ANSWER 18 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1998:487883 HCAPLUS
DN 129:181888
TI **Optoelectronic** device packages
IN Sirovski, Leo Maria; Cunningham, John Edward; Gusaro, Lucian Arthur; Goossen, Keith Wayne
PA Lucent Technologies Inc., USA
SO Jpn. Kokai Tokkyo Koho, 10 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 10189661	A2	19980721	JP 1997-341336	19971211
PRAI	US 1996-766215		19961212		

AB The packages comprise: a GaAs-based LED, laser and photodiode chips; contact pads using Ti, **Ni**, **Au** and/or Cr; ohmic contacts employing BeAu; barrier pads contg. AlSi, AlCu and/or AlSiCu; and solder bonds using **Sn**, PbSn, and/or In.

L19 ANSWER 19 OF 30 HCAPLUS COPYRIGHT 2002 ACS

AN 1997:612675 HCAPLUS
DN 127:300989
TI Optical signal distribution to MSM photodetector arrays via integrated polyimide waveguides
AU Callender, Claire L.; Robitaille, Lucie; Noad, Julian P.; Gouin, Francois; Almeida, Carlos A.
CS Communications Res. Cent., Ottawa, ON, K2H 8S2, Can.
SO Journal of Lightwave Technology (1997), 15(9), 1700-1707
CODEN: JLTEDG; ISSN: 0733-8724
PB Institute of Electrical and Electronics Engineers
DT Journal
LA English
AB The integration of metal-semiconductor-metal (MSM) photodetector arrays with polyimide ridge waveguides is demonstrated. MSM detectors were fabricated using transparent indium **tin** oxide (ITO) interdigitated electrodes on semiinsulating GaAs substrates. An optical buffer layer of SiO2 was deposited and patterned, and then polyimide ridge waveguides were fabricated on top by spin coating and photolithog. The guides were multimode with widths from 10 to 50 .mu.m. Light at 830 nm was coupled efficiently from the waveguides through gaps in the SiO2 buffer layer into the underlying detector structures. Abs. responsivities of the integrated MSM devices were around 0.5 A/W and the 3 dB bandwidths of 5-6 GHz were measured. Division of the input signal between sets of two and four detectors under a single waveguide has been achieved, highlighting the potential for the fabrication of integrated **optoelectronic** switches.

L19 ANSWER 20 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1997:211003 HCAPLUS
DN 126:205579
TI Solid imaging devices with COG structure
IN Watanabe, Eiji; Hasegawa, Jun
PA Fuji Film Micro Device, Japan; Fuji Photo Film Co Ltd
SO Jpn. Kokai Tokkyo Koho, 10 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 09027606	A2	19970128	JP 1995-175856	19950712

AB The devices contain transparent glass substrates, light-receiving domains which convert incident light into electricity, semiconductor chips with a no. of terminals, and light-shielding elec. conductive materials (e.g., **Ni**) formed on the part of the substrates facing the chips.

L19 ANSWER 21 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1996:677581 HCAPLUS
DN 126:12771
TI A new cost effective packaging technique for **optoelectronic** devices
AU Dohle, G. Rainer; Callahan, John J.; Drabik, Timothy J.; Martin, Kevin P.
CS School Electrical and Computer Engineering, Georgia Institute Technology, Atlanta, GA, 30332-0269, USA
SO Proceedings - Electronic Components & Technology Conference (1996), 46th, 1301-1307
CODEN: PETCES
PB Institute of Electrical and Electronics Engineers
DT Journal

LA English
AB The authors report their results in the optimization of the bonding parameters, with different diffusion barriers, new multilayer structures, metalization of the transfer membrane, as well as new applications of the bonding technique. The bonded samples were studied with several std. surface anal. techniques as well as mech. tests. The authors achieved important improvements in reliability, yield, and in the planarity of the bonded devices. For a further enhancement of the bonding quality and to reduce the mech. stress, induced by the mismatch of the coeffs. of thermal expansion of the bonding partners, the authors studied an annealing technique. The main advantages of this technol. are thin bonding layers attained with a min. use of **Au** and an outstanding bonding quality succeeded in the large temp. range between 235.degree. and 286.degree. without flux. A thin, void free AuSn bonding layer means low thermal resistance, which is esp. important for laser diodes and high power devices: The threshold current of semiconductor laser diodes is very temp. sensitive. Further advantages of the new technique are the attainable precise control of the bonding layer thickness, which means very reproducible thermal resistance, for instance.

L19 ANSWER 22 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1996:191096 HCAPLUS
DN 124:301853
TI A new bonding technique for microwave devices
AU Dohle, G. Rainer; Callahan, John J.; Martin, Kevin P.; Drabik, Timothy J.
CS School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA, 30332-0250, USA
SO IEEE Trans. Compon., Packag., Manuf. Technol., Part B (1996), Volume Date 1996, 19(1), 57-63
CODEN: IMTBE4; ISSN: 1070-9894
DT Journal
LA English
AB Over the past 5 yr, a great deal of work was done to perform semiconductor die attach with AuSn alloys. Successful die attach has recently been achieved using **Au** and **Sn** multilayers evapd. onto the die or the host substrate. However, bonding techniques with thin (<5 .mu.m) AuSn layers for very thin semiconductor devices have not yet been reported. The increasing demand for more advanced **optoelectronic** integrated circuits has created the need to bond materials having different lattice consts. (e.g., GaAs on Si). The authors report a new way for the bonding of epitaxial lift-off (ELO) devices onto host substrates. Three of the multilayer structures studied in this work produce a AuSn alloy bond with .apprx.84% **Au**, but can be bonded with a peak temp. <280.degree.. The bonded samples were studied with several std. surface anal. techniques: Optical microscopy, SEM, and energy dispersive x-ray anal. (EDX). Much thinner bonding layers can be attained than thus far reported. The results of the research allow one to optimize the layer structure and bonding parameters.

L19 ANSWER 23 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1996:73328 HCAPLUS
DN 124:99048
TI Inorganic-containing composites
IN Gallagher, Michael Kenrick; Manziek, Larry; Langenmayr, Eric Jon
PA Rohm and Haas Co., USA
SO Eur. Pat. Appl., 16 pp.
CODEN: EPXXDW
DT Patent
LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 689871	A2	19960103	EP 1995-303309	19950517
	EP 689871	A3	19960724		
	EP 689871	B1	20000621		
	R: BE, DE, DK, ES, FR, GB, IT, NL				
	US 5540981	A	19960730	US 1994-251535	19940531
	ES 2147262	T3	20000901	ES 1995-303309	19950517
	CA 2150078	AA	19951201	CA 1995-2150078	19950524
	BR 9502592	A	19960423	BR 1995-2592	19950529
	FI 9502626	A	19951201	FI 1995-2626	19950530
	JP 08002928	A2	19960109	JP 1995-155567	19950531
PRAI	US 1994-251535	A	19940531		

AB Composites, and a method for prepg. composites, are provided. The composites comprise a plurality of domains on the surface(s) of a support material, and the domains contain one or more inorg. compds. The method comprises contacting a support material with one or more metal-loaded polymers and removing the polymer(s).

L19 ANSWER 24 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1995:854379 HCAPLUS
DN 123:241481
TI Amorphous silicon color detector
IN Kuo, Lee-ching; Tzeng, Ming-hann; Fang, Yean-kuen
PA Industrial Technology Research Institute, Taiwan
SO U.S., 13 pp.
CODEN: USXXAM
DT Patent
LA English
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 5449923	A	19950912	US 1992-861294	19920331
	US 5789263	A	19980804	US 1995-475191	19950607
PRAI	US 1992-861294		19920331		

AB Amorphous silicon color detectors, which comprise a vertical-type back-to-back Schottky diode which has a structure of a transparent conductive oxide film layer/an undoped amorphous silicon layer/metal layer, are described in which the amorphous silicon color detector includes two Schottky junctions, one of which is the junction of the metal layer/the undoped amorphous silicon layer and the other of which is the junction of the transparent conductive oxide film layer/undoped amorphous silicon layer, the undoped amorphous silicon layer has a thickness .gtoreq.0.9 .mu.m, and is capable, upon application thereto of bias voltages within the range of .+-.1.5 V, of identifying red, blue, and green lights. The metal layer can be formed from a metal selected from the group consisting of **Au**, Pd, Cr, Al, **Pt**, Ti, Mo, and Ag and the metal layer is a metal electrode of the Schottky diode. The transparent conductive oxide film may be a film selected from the group consisting of an indium **tin** oxide thin film, a SnO2 thin film, and a ZnO thin film. The amorphous silicon color image sensor is esp. used in a scanning machine or a fax machine.

L19 ANSWER 25 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1995:683898 HCAPLUS
DN 123:156010
TI Design, fabrication and modeling of high-speed metal-semiconductor-metal (MSM) photodetectors with indium-**tin**-oxide (ITO) and Ti/

Pt/Au contacts
AU Beaulieu, Christian; Gouin, Francois; Noad, Julian; Hartman, William; Lisicka-Skrzek, Eva; Vineberg, Karen; Berolo, Ezio
CS Communications Research Center, Ottawa, ON, K2H 8S2, Can.
SO Proc. SPIE-Int. Soc. Opt. Eng. (1995), 2397(Optoelectronic Integrated Circuit Materials, Physics, and Devices), 534-43
CODEN: PSISDG; ISSN: 0277-786X
DT Journal
LA English
AB Metal-semiconductor-metal photodetectors were fabricated on undoped epitaxial GaAs material with **Au** and In-**Sn**-oxide interdigitated contacts. In both cases, various electrode configurations were layered out with combinations of finger spacings and finger widths ranging from 1 to 3 .mu.m and detector cross sections of 25.times.25, 50.times.50 and 100.times.100 .mu.m2. Frequency response measurements were carried out up to 20 GHz using a high-speed electrooptic modulator combined with a DC-operated laser diode and an ultrafast photodetector for system calibration. This frequency domain technique ensures accurate measurement of true analog bandwidth compared to time-domain techniques which can easily lead to an overestimation of photodetector bandwidth. Photodetector responsivity was plotted as a function of bias voltage. For similar devices, Ti/**Pt/Au** contact MSMs require lower bias voltages before they reach their satn. bandwidth than ITO contact MSMs. For a 100.times.100 .mu.m2 ITO MSM with a 2 .mu.m finger width and a 2 .mu.m finger spacing, the 3 dB bandwidth is 4 GHz at 10 V bias. By comparison, similar **Au** contact MSMs exhibit 3 dB bandwidths >12 GHz. The difference in speed is partly explained by the higher device parasitics of the ITO MSMs, as confirmed by S11 measurements made on both types of device. The S11 data was also used to ext. the MSM equiv. circuit parameters for a high-frequency MSM model. Similar measurements on other electrode configurations show that as expected, the speed of ITO MSMs becomes considerably higher as device size is decreased, until the limit where transit-time effects start to dominate the overall performance.

L19 ANSWER 26 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1994:20498 HCAPLUS
DN 120:20498
TI Reliable metalization system for flip-chip **optoelectronic** integrated circuits
AU Wada, Osamu
CS Fujitsu Lab. Ltd., Atsugi, 243-01, Japan
SO Mater. Res. Soc. Symp. Proc. (1992), 260(Advanced Metallization and Processing for Semiconductor Devices and Circuits-II), 713-21
CODEN: MRSPDH; ISSN: 0272-9172
DT Journal
LA English
AB The thermal stability of evapd. Pd, **Pt**, and Rh films as reaction barriers to **Au-Sn** solder was studied for application to flip-chip **optoelectronic** integration. **Sn** in the solder diffused preferentially into a barrier metal uniformly to produce more stable intermetallic phases for all three metals. **Pt** and Rh exhibited sufficiently small interdiffusion coeffs. with high activation energies in the temp. range of device operation (**Pt**: 1.35 eV, Rh: 1.95 eV). This result demonstrates the usefulness of **Pt** and Rh in practical flip-chip integrated-circuit fabrication. An aging test was conducted on flip-chip (Ga,In)As/InP p-i-n photodiodes with **Au-Sn/Pt** metalization, and no severe degrdn. was obsd. over 3400 h at 180.degree.. The same metalization

techniques were applied in the fabrication of 10 Gbps **optoelectronic** integrated receivers as well as quad p-i-n photodiodes for coherent optical receivers.

L19 ANSWER 27 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1993:483907 HCAPLUS
DN 119:83907
TI Reliable metallization system for flip-chip **optoelectronic** integrated circuits
AU Wada, Osamu
CS Fujitsu Lab. Ltd., Atsugi, 243-01, Japan
SO Mater. Res. Soc. Symp. Proc. (1992), 265(Materials Reliability in Microelectronics II), 155-63
CODEN: MRSPDH; ISSN: 0272-9172
DT Journal
LA English
AB Thermal stability of evapd. Pd, **Pt** and Rh films as reaction barriers to **Au-Sn** solder was studied for the application to flip-chip **optoelectronic** integration. **Sn** in the solder diffused preferentially into a barrier metal uniformly to produce more stable intermetallic phases for all three metals. **Pt** and Rh exhibited sufficiently small interdiffusion coeffs. with high activation energies in the temp. range of device operation (**Pt**: 1.35 eV, Rh: 1.95 eV).

L19 ANSWER 28 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1987:187612 HCAPLUS
DN 106:187612
TI Substrates for photoelectric devices
IN Ishihara, Shinichiro; Kitagawa, Masatoshi
PA Matsushita Electric Industrial Co., Ltd., Japan
SO Jpn. Kokai Tokkyo Koho, 4 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 62012171	A2	19870121	JP 1985-150751	19850709

AB A substrate for a photoelec. device consists of: (a) an insulator wafer from glass or alumina, an Al sheet with oxidized surface, or a metal sheet coated with a thermally resistant resin for insulation; (b) a 1st elec. conductive film from an oxide of In, **Sn**, or Cd, or a film from Al, **Au**, Ag, Cu, or Mn; and (c) a 2nd elec. conductor film from Cr, **Ni**, W, Tl, Nb, Mo, or Ti. The substrate does not cause cracks or peel off of layers.

L19 ANSWER 29 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1984:44026 HCAPLUS
DN 100:44026
TI Plating of metal electrodes
PA Ricoh Co., Ltd., Japan
SO Jpn. Kokai Tokkyo Koho, 3 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE

PI JP 58164272 A2 19830929 JP 1982-46943 19820324
AB An economical and efficient method for plating the electrodes and exposing the plating leads consists of forming a transparent conductor film on glass, patterning Ni based electrodes on the films, placing a resist mask on the electrode, plating electrolytically, removing the mask, and blowing with N2 to expose the leads.

L19 ANSWER 30 OF 30 HCAPLUS COPYRIGHT 2002 ACS
AN 1983:531179 HCAPLUS
DN 99:131179
TI Optical waveguides in semiconductors
IN Alferness, Rodney Clifford; Kaminow, Ivan Paul
PA Western Electric Co., Inc. , USA
SO Ger. Offen., 29 pp.
CODEN: GWXXBX
DT Patent
LA German
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 3300132	A1	19830721	DE 1983-3300132	19830104
	JP 58120208	A2	19830718	JP 1982-227860	19821228
PRAI	US 1982-336598		19820104		

AB Optical stripe waveguides in semiconductors, e.g. InP and InGaAsP, can be formed by a diffusion of metals at 400-600.degree. for 1 h. One or more metal from the following group can be used: Si, Ge, **Sn**, Te, Se, As, P, Sb, Cd, Zn, In, Ga, Al, **Fe**, Cr, Cu, Ag, and **Au**. The metals can either be deposited by pptg. on a properly marked semiconductor surfaces or the surface can be brought in contact with vapors of compds. contg. such metals.

L22 ANSWER 1 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 2002:540050 HCAPLUS
DN 137:82295
TI Formation of soldered joints having a transient liquid phase by annealing and quenching, and suitable for integrated circuits
IN Blackshear, Edmund; Chalco, Pedro
PA USA
SO U.S. Pat. Appl. Publ., 8 pp.
CODEN: USXXCO
DT Patent
LA English
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2002092895	A1	20020718	US 2001-759113	20010112

AB Soldering is provided using transient liq. phase method by annealing and quenching. The method includes (a) depositing a first compn. of metals having a **eutectic** point on a first article to be joined; (b) depositing a second compn. of metals on a second article to be joined wherein the constituents of the first and second compns. of metals are the same and the second compn. of metals has a higher melting range than the first compn. of metals; (c) placing the first article in contact with the second article; (d) heating to a temp. above the m.p. of the **eutectic** compn. of the first compn. of metals for a predetd. period of time to form a mixed-phase solder joint; (e) holding at a temp. below the m.p. of the **eutectic** compn. for a predetd. period of time to cause the first and second compns. of metals to mix homogeneously in the solid state and form a single phase solder joint; and (f) cooling. The first and second compns. of metal comprise Pb, Sn, Bi, Ag, Au, and Cu. The method allows the attainment of a single phase solder joint at room temp. which will not reflow in subsequent thermal processing above the initial reflow temp. and thus obviates the need for a solder material hierarchy. The method is suitable in semiconductor processing, e.g., in high speed computers for packaging and interconnection.

L22 ANSWER 2 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:312506 HCAPLUS
DN 134:299403
TI Ag-Cu-Zn or Ag-Cu-Cd-Zn braze alloys manufactured as ribbons by melt quenching
IN Dutkiewicz, Jan
PA Polska Akademia Nauk, Instytut Metalurgii i Inzynierii Materialowej, Pol.
SO Pol., 4 pp.
CODEN: POXXA7
DT Patent
LA Polish
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	PL 179234	B1	20000831	PL 1996-313852	19960419

AB The braze alloys suitable for manuf. of melt-quenched ribbons contain: (a) Ag 55-60, Cu 25-30, and Zn 20-26% (ternary **eutectic** type); (b) Ag 44-48, Cu 32-36, and Sn 18-22%; (c) Ag 15-20, Cu 28-32, and Cd 51-54%; (d) Ag 40-45, Cu 12-15, Cd 29-32, and Zn 9-11%; or (e) Ag 58-63, Cu 12-16, Sn 11-15, and Zn 6-9%. The braze alloy suitable for melt-quenched ribbons 40-70 .mu.m thick contains Ag 66.25, Cu 12.25, Sn 12.0, and Zn 9.5%.

L22 ANSWER 3 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:263260 HCAPLUS
DN 134:314457
TI Effect of Ag content on properties of Sn-Ag **binary** alloy **solder**
AU Suganuma, Katsuaki; Huh, Seok-Hwang; Kim, Keunsoo; Nakase, Hirofumi; Nakamura, Yoshikazu
CS Institute of Scientific and Industrial Research, Osaka University, Ibaraki, 567-0047, Japan
SO Materials Transactions (2001), 42(2), 286-291
CODEN: MTARCE; ISSN: 1345-9678
PB Japan Institute of Metals
DT Journal
LA English
AB Sn-Ag binary alloys, with Ag content in the range between 0 and 4.0 wt.% were examd. to understand the effect of Ag addn. on microstructural and mech. properties of the solders. Fine Ag3Sn fibrous ppts. form the Ag3Sn/Sn **eutectic** network surrounding the .beta.-Sn primary grains. Increasing Ag content produces finer ppts. and finer networks. Sn-4.0 wt.% Ag has addnl. large Ag3Sn primary particles. Thermal expansion coeff. of the alloy decreases with increasing Ag content. The 0.2% proof stress of Sn-Ag alloy increases with increasing Ag content up to 4.0 wt.% Ag, and is higher than that of Sn-37 wt.% Pb solder above 2.0 wt.% Ag. In contrast, tensile strength increases up to 3.5 wt.% Ag but decreases at 4.0 wt.% Ag slightly. The formation of primary Ag3Sn is attributed to the degrdn. at 4.0 wt.% Ag. The wettability of the Sn-Ag alloys on Cu is slightly improved by the Ag addn. but is worse than Sn-37 wt.% Pb solder. Two intermetallic layers are formed at the interface, Cu3Sn adjacent to Cu and Cu6Sn5 adjacent to the solder. The Cu6Sn5 layer is thicker than the Cu3Sn layer and grows into the solder forming scallop shapes. The thickness of the reaction layers slightly increases with increasing Ag content. The compn. of Sn-(2-3.5 wt.%)Ag is the best selection for obtaining high joint strength. Sn-Ag alloy is superior to Sn-37 wt.% Pb solder for establishing a rigid interface.
RE.CNT 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L22 ANSWER 4 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 1999:522788 HCAPLUS
DN 131:289646
TI Influence of alloy composition on lift-off phenomenon in tin binary alloys
AU Takao, Hisaaki; Hasegawa, Hideo
CS TOYOTA CENTRAL R&D LABS., INC, Nagakute, Aichi, 480-1192, Japan
SO Symposium on "Microjoining and Assembly Technology in Electronics" (1999), 5th, 381-386
CODEN: SMAEFT
PB Yosetsu Gakkai
DT Journal
LA Japanese
AB The effect of alloy compn. on lift-off phenomena was investigated in Sn-Bi, Sn-Pb, and Sn-In alloys. Lift-off was obsd. in Sn-(1-30)Bi, Sn-(1-5)Pb, and Sn-(2-15) wt.% In solder joints, while not obsd. in pure Sn, Sn-(40-62)Bi, Sn-(10-45)Pb and Sn-43 wt.% In. The formation of the Bi-rich layer at the solder-Cu land interface was not correlated with the probability of lift-off occurrence. The solidification range was correlated with the probability of lift-off occurrence among solders with lift-off, but even in the solders with comparatively large solidification range, as Sn-40Bi with 35.degree.C, lift-off was not obsd. A time kept at the solidus temp. of the solder in its **eutectic** solidification

was well correlated with the occurrence of lift-off. In solders with the hold time of above 50s/cm3, lift-off was not occurred.

L22 ANSWER 5 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 1999:28096 HCAPLUS
DN 130:84686
TI Lead-free soldering method and system
IN Tadauchi, Masahiro; Gonda, Makoto; Goto, Yoshiyuki; Furuya, Tomiaki; Teshima, Kouichi; Komatsu, Izuru; Gotanda, Takeshi
PA Kabushiki Kaisha Toshiba, Japan; Kuroda Denki Kabushiki Gaisha
SO Ger. Offen., 26 pp.
CODEN: GWXXBX
DT Patent
LA German
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 19827014	A1	19981224	DE 1998-19827014	19980617
	JP 11010385	A2	19990119	JP 1997-161644	19970618
	US 6123248	A	20000926	US 1998-99522	19980618
PRAI	JP 1997-161644	A	19970618		

AB A Pb-free **binary solder** consisting of Sn, a metal forming a **eutectic** alloy with Sn, other metals .ltoreq.0.1 wt.%, and O .ltoreq.100 ppm is melted in a non-oxidizing atm. and deposited on a substrate to be soldered in an atm. contg. .ltoreq.2,000 ppm O. The soldering app. contains an oscillator to supply waves at a frequency of 15 kHz-1 MHz. The solder is suitable for joining of metals, ceramics, glass, and polymers.

L22 ANSWER 6 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 1998:736200 HCAPLUS
DN 130:19553
TI Effects of palladium and solder aging on mechanical and fatigue properties of tin-lead **eutectic** solder
AU Vaynman, S.; Ghosh, G.; Fine, M. E.
CS Department of Materials Science and Engineering, Northwestern University, Evanston, IL, 60208-3108, USA
SO Journal of Electronic Materials (1998), 27(11), 1223-1228
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB The effects of (1) 0.5 wt.% of Pd addn., and (2) aging on mech. and fatigue properties of **eutectic** solder (63Sn37Pb) were investigated. The creep rate of **eutectic** solder at room temp. is not affected by Pd addn. However, at 80.degree., solder contg. Pd creeps slower than Sn-Pb **eutectic**. The strain rate dramatically affects yield and tensile stress of **eutectic** solder with Pd as it does for the **binary solder**. Isothermal fatigue life of solder at 25.degree. is essentially not changed by Pd addn. The microstructure of Pd-contg. solder consisted of polyhedral grains of lead, tin, and a dispersion of PdSn4 intermetallic. Significant microstructural changes and interphase interface phenomena take place during creep deformation at 25 and 80.degree.. Ambient aging for seven years leads to solder softening and to a moderate increase in isothermal fatigue life.
RE.CNT 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L22 ANSWER 7 OF 15 HCAPLUS COPYRIGHT 2002 ACS

AN 1998:721484 HCAPLUS
DN 129:334304
TI Lead-free tin-zinc alloy solder for use on electronic-circuit parts
IN Tadauchi, Masahiro; Teshima, Kouichi; Komatsu, Izuru; Nakamura, Shinichi; Furuya, Tomiaki; Hatanaka, Tatsuya; Hayashi, Masaru; Suzuki, Isao; Higashinakagawa, Emiko; Arai, Shinji; Yabuki, Motonaka
PA Kabushiki Kaisha Toshiba, Japan
SO Eur. Pat. Appl., 30 pp.
CODEN: EPXXDW
DT Patent
LA English
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 875331	A2	19981104	EP 1997-116635	19970924
	EP 875331	A3	19990421		
	EP 875331	B1	20011121		
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI				
	JP 10303518	A2	19981113	JP 1997-108487	19970425
	CN 1197996	A	19981104	CN 1997-129783	19971231
	US 6280858	B1	20010828	US 2000-619470	20000719
PRAI	JP 1997-108487	A	19970425		
	US 1997-936118	B1	19970924		

AB The **binary**-type **solder** alloy suitable for bonding of elec.-circuit or electronic parts contains Zn 3-12%, Sn base, O <100 ppm, other metals at <0.1%, and preferably no Bi or Sn. The bonding solder interlayer .apprx.1 .mu.m thick is formed on the substrate for mounting of electronic parts, and is concd. for the Zn content .gtoreq.70%, vs. the opposite or adjacent solder layer as the Sn-Zn **eutectic**-type alloy contg. 5.8-11.7% Zn for decreased melting temp. The bonding solder interlayer with the Zn-rich surface film nominally 30-120 .ANG. thick can prevent migration damage in electronic app. The **eutectic** Sn-9% Zn alloy (m.p. 471 K) contg. 20-100 ppm O was suitable for soldering of Cu-strip specimens to form a ductile joint, vs. impaired wettability at 150 ppm O, or a brittle joint for the Sn-9 Zn-5% Bi alloy solder having lower m.p. of 464 K. The Sn-Zn alloy powder is suitable for fluxed solder pastes applied by screen printing.

L22 ANSWER 8 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 1998:550828 HCAPLUS
DN 129:321088
TI Rapidly quenched micropreforms made of biocompatible alloys for precise high-quality soldering of medical devices
AU Monstadt, H.; Bohl, M.; Kobus, E.; Huhner, M.; Eggeler, G.
CS Bochum, Germany
SO DVS-Berichte (1998), 192(Hart- und Hochtemperaturloeten und Diffusionsschweissen), 179-181
CODEN: DVSBA3; ISSN: 0418-9639
PB Verlag fuer Schweissen und Verwandte Verfahren DVS-Verlag
DT Journal
LA German
AB The purpose of the present work was the development of near net shape soldering solns. for medical applications. Soldering of high strength, stainless steel core wires with noble metal alloys will be produced with biocompatible soldering material at working temps. below 400.degree.C. The prodn. technique needs the selection of solder materials having defined melting temp. area and a defined geometric form. The binary Au-Sn alloy system has a **eutectic** point at a compn. of 80 mass% Au.

Investigations were examd. with compns. from about 78 mass % Au to 82 mass % Au. Solidification at low temp. rates will cause a 2 phase structure from the intermetallic AuSn phase .delta. + .zeta.'. The ductility of the investigated alloys was limited. Rapid solidification increases the ductility. A precision cutting process under heat treatment conditions could work out defined micro preforms from that material. The thickness varied between 20 .mu.m and 130 m. The outer diam. was 0.6 mm, the inner diam. 0.4 mm. The geometric form of the preform could be well positioned on the core wire and the coil. The optimal cutting working temps. were 150.degree.C. The ribbon thickness has to be above 100 .mu.m. The precise soldering of the medical products were conducted with a high frequency soldering system at soldering working temps. of about 350.degree.C.

L22 ANSWER 9 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 1997:297727 HCAPLUS
DN 126:333026
TI Prediction of interface reaction products between Cu and various solder alloys by thermodynamic calculation
AU Lee, Byeong-Joo; Hwang, Nong Moon; Lee, Hyuck Mo
CS Materials Evaluation Center, Korea Research Institute of Standards and Science, Taejon, 305-600, S. Korea
SO Acta Materialia (1997), 45(5), 1867-1874
CODEN: ACMAFD; ISSN: 1359-6454
PB Elsevier
DT Journal
LA English
AB A new scheme to predict the intermetallic compd. which forms first at the substrate/solder interface during the soldering process has been suggested. A local equil. was assumed at the interface between the substrate and the liq. solder. By calcg. metastable equil. between the substrate and the liq. solder phases and by comparing the calcd. driving forces of formation for individual phases, the compd. which forms first at the substrate/solder interface could be successfully predicted. The prediction of interface reactions between Cu substrate and Sn-Pb, Sn-Bi and Sn-Zn **binary eutectic solder** was in agreement with already known exptl. results.

L22 ANSWER 10 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 1995:209080 HCAPLUS
DN 122:86770
TI Phase diagrams of &(goldbinary solder) ternary alloy systems by Smith thermal analysis
AU Hayes, F. H.; Chao, W. T.; Robinson, J. A. J.
CS Materials Sci. Center, Univ. Manchester, Manchester, M1 7HS, UK
SO Journal of Thermal Analysis (1994), 42(4), 745-58
CODEN: JTHEA9; ISSN: 0368-4466
PB Akademiai Kiado
DT Journal
LA English
AB Application of the Smith thermal anal. method to the exptl. detn. of ternary alloy phase diagrams is illustrated by ref. to a study of the Au-Pb-Bi system. This system, which is of interest in relation to soft-soldered interconnections in solid state device technol., exhibits a ternary **eutectic** and several transition peritectic reactions.

L22 ANSWER 11 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 1994:584906 HCAPLUS
DN 121:184906

TI Investigation of multi-component lead-free solders
AU Loomans, M. E.; Vaynman, S.; Ghosh, G.; Fine, M. E.
CS Northwestern Univ., Evanston, IL, 60208-3108, USA
SO J. Electron. Mater. (1994), 23(8), 741-6
CODEN: JECMA5; ISSN: 0361-5235
DT Journal
LA English
AB Binary phase diagrams of interest for lead-free solder development have been entered into the Thermo-CALC data base. These may be used directly to calc. multi-component phase relations vs. temp. provided there are no ternary or higher order interactions. Such occur in the Sn-Ag-Zn system and are being evaluated. Contact angles of a no. of solder-flux combinations on copper were directly measured in spreading tests. With a rosin-iso-Pr alc. flux, the contact angles of **binary eutectic solders** were in degrees: Sn-Bi at 166.degree.C, 40; Sn-Zn at 225.degree.C, 60; Sn-Ag at 250.degree.C, 45. These angles were little affected by a no. of 1% ternary addns. to the solder. The contact angles were 20 degrees or less when SnCl2 was used as a flux. The SnCl2 reacts with Cu to form Cu3Sn. The most likely successful approach to obtain satisfactory wetting with lead-free solders appears to be development of a satisfactory flux.

L22 ANSWER 12 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 1991:518640 HCAPLUS
DN 115:118640
TI Effects of cooling rate on mechanical properties of near-**eutectic** tin-lead solder joints
AU Mei, Z.; Morris, J. W., Jr.; Shine, M. C.; Summers, T. S. E.
CS Cent. Adv. Mater., Lawrence Berkeley Lab., Berkeley, CA, 94720, USA
SO J. Electron. Mater. (1991), 20(8), 599-608
CODEN: JECMA5; ISSN: 0361-5235
DT Journal
LA English
AB The effect of cooling rate during solidification on the shear, creep, and low-cycle shear fatigue behavior of 60 Sn/40 Pb soldered joints and on bulk solder tensile properties was investigated. Soldered joints were made with 3 different initial microstructures by quenching, air cooling, and furnace cooling. The joints have similar steady-state strain rates under creep at relatively high shear stresses, but creep at different strain rates at lower shear stresses. The results are ascribed to the refined grain size and less lamellar phase morphol. that results on increasing the cooling rate. Tensile tests on bulk **solders** cold-worked, **quenched**, and furnace-cooled show that a higher cooling rate decreases the strength and increases ductility at low strain rates. The fatigue life of **quenched soldered** joints is longer than that of the furnace-cooled joints.

L22 ANSWER 13 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 1991:476626 HCAPLUS
DN 115:76626
TI A microstructural study of creep and thermal fatigue deformation in 60tin-40lead solder joints
AU Tribula, D.
CS Lawrence Berkeley Lab., Berkeley, CA, USA
SO Report (1990), LBL-29018; Order No. DE91005404, 78 pp. Avail.: NTIS
From: Energy Res. Abstr. 1991, 16(3), Abstr. No. 7729
DT Report
LA English
AB Thermal fatigue failures of solder joints in electronic devices often

arise from cyclic shear strains imposed by the mismatched thermal expansion coeffs. of the components as temp. changes are encountered. The creep behavior of solder joints was studied to det. the microstructural response and relate this to the more complex problem of thermal fatigue. Creep failure arise from the inherent inhomogeneity and instability of the solder microstructure and suggest that small compn. changes in the near-**eutectic** Pn-Sn alloy defect the obsd. failure mechanisms. Creep and thermal fatigue data are presented for several near-**eutectic** Pb-Sn solders and indicate that a 58Sn-40Pb-2In and 58Sn-40Pb-2% Cd alloy show significantly enhanced fatigue resistance over that of the simple **binary** Pb-Sn **solder**.

L22 ANSWER 14 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 1991:92636 HCAPLUS
DN 114:92636
TI Superplastic creep of **eutectic** tin-lead solder joints
AU Mei, Z.; Grivas, D.; Shine, M. C.; Morris, J. W., Jr.
CS Cent. Adv. Mater., Lawrence Berkeley Lab., Berkeley, CA, 94720, USA
SO J. Electron. Mater. (1990), 19(11), 1273-80
CODEN: JECMA5; ISSN: 0361-5235
DT Journal
LA English
AB This paper presents exptl. evidence that as-solidified **eutectic** Pb-Sn solder joints can exhibit superplastic behavior in shear creep loading. Stepped load creep tests of as-solidified joints show a change in the stress exponent from a high value typical of conventional creep at high stress and strain rate to a superplastic value near 2 at lower stress and strain rates. In addn., the change in stress exponent is accompanied by a change in the activation energy for creep from a value near that for bulk self-diffusion (20 kcal/mol) to a value near that for grain boundary diffusion (12 kcal/mol). The total shear deformation of joints in stress-rupture tests performed at 65.degree. are found to exceed 150%. The concomitant observation that **quenched solder** joints creep faster than air-cooled ones is attributed to a grain, or phase, size dependence of the strain rate. The source of superplastic behavior is a fine, equiaxed microstructure. It is not yet clear whether the superplastic microstructure is present in the as-solidified joint, or develops during the early stages of plastic deformation.

L22 ANSWER 15 OF 15 HCAPLUS COPYRIGHT 2002 ACS
AN 1985:545859 HCAPLUS
DN 103:145859
TI The wetting and mechanical properties of lead-free capillary plumbing solders
AU Warwick, M. E.
CS Int. Tin Res. Inst., Greenford/Middlesex, UK
SO Brazing Soldering (1985), (8), 20-6
CODEN: BRSODT; ISSN: 0263-0060
DT Journal
LA English
AB A comparative study of the properties of **binary** Sn **solder** alloys contg. Cu, Ag, or Sb was made. In general, the wetting and mech. properties of the alloys were as good as those of Sn-Pb solders conventionally used to make capillary joints in Cu pipes. Sn showed equally good properties, and practical plumbing joints made with it contained solder with a compn. approximating that of the Cu-Sn **eutectic**.

L25 ANSWER 1 OF 5 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:195475 HCAPLUS
DN 134:259706
TI Effect of atmosphere on the fluxless wetting properties of UBM-coated Si-wafer to the Pb-free solders
AU Hong, Soon-Min; Park, Jae-Yong; Park, Chang-Bae; Jung, Jae-Pil; Kang, Choon-Sik
CS Sch. Mater. Sci. Eng., Seoul Natl. Univ., Seoul, 151-744, S. Korea
SO Taehan Kumsok Hakhoechi (2001), 39(1), 116-125
CODEN: TKHCDJ; ISSN: 0253-3847
PB Korean Institute of Metals and Materials
DT Journal
LA Korean
AB The wetting balance method was used to est. the fluxless wetting properties of under bump metallurgy (UBM)-coated Si-wafer to the **binary** lead-free **solders** (SnAg, SnSb, SnIn, SnBi, SnZn). The wetting property estn. of UBM-coated Si-wafer was possible with the new wettability indexes from the wetting curves of one side coated specimen; Fmin, Fs and t5. For UBM of Si-chip, **Au**/Cu/Cr UBM is better than **Au**/Ni/Ti in the point of wetting time. At general reflow process temp., the wettability of high m.p. solders (SnSb, SnAg) is better than that of low m.p. ones (SnBi, SnIn). The nitrogen atm. made more significant improvement in fluxless wettability than in fluxed wettability. The contact angle of the one side-coated Si-plate to the solder could be calcd. from the force balance equation by measuring the static state force and the tilt angle.

L25 ANSWER 2 OF 5 HCAPLUS COPYRIGHT 2002 ACS
AN 1997:69705 HCAPLUS
DN 126:93204
TI Lead-free solder
IN Nakanishi, Teru; Karasawa, Kazuaki; Akamatsu, Tosha; Shimizu, Kozo
PA Fujitsu Ltd, Japan
SO Jpn. Kokai Tokkyo Koho, 5 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 08290288	A2	19961105	JP 1995-95339	19950420
	JP 3185600	B2	20010711		

AB The **solder** is a **binary** alloy of In, Bi, and **Sn**
. The parts to be soldered are pre-coated with a layer of **Au**, Ag, Cu, Ni, Pd, or Pt to promote solder wettability before soldering with the Pb-free solder.

L25 ANSWER 3 OF 5 HCAPLUS COPYRIGHT 2002 ACS
AN 1986:38543 HCAPLUS
DN 104:38543
TI Rapidly solidified soldering filler metals
IN Bedell, John Robert; Hemmat, Naim; Rabinkin, Anatol; Bose, Debasis; Datta, Amitava; DeCristofaro, Nicholas John
PA Allied Corp., USA
SO Eur. Pat. Appl., 26 pp.
CODEN: EPXXDW
DT Patent
LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 144998	A2	19850619	EP 1984-114990	19841208
	EP 144998	A3	19850731		
	R: DE, FR, GB, IT				
	JP 60199593	A2	19851009	JP 1984-263719	19841213
PRAI	US 1983-561100		19831213		
	US 1984-622313		19840619		
	US 1984-672682		19841121		

AB Alloy foil for soldering or brazing is manufd. by melt quenching, and has a homogeneous structure in thickness of 12-200 .mu. and width >2 mm. The alloy consists of .gtoreq.2 of **Au**, Ag, Pb, Bi, Si, **Sn**, Sb, In, and/or Ge. The foil structure is optionally amorphous or microcryst., and the surface shows no contamination with org. impurities. Thus, a molten alloy [72089-57-7] contg. **Sn** 65, Ag 25, and Sb 10% was rapidly solidified by quenching on a spinning chill roll. The resulting solder foil showed a homogeneous structure. Conventionally rolled foil showed a chem. inhomogeneous structure due to segregation of Ag.

L25 ANSWER 4 OF 5 HCAPLUS COPYRIGHT 2002 ACS
AN 1985:189496 HCAPLUS
DN 102:189496
TI Thin solder tape
PA Furukawa Electric Co., Ltd., Japan
SO Jpn. Kokai Tokkyo Koho, 4 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 59220298	A2	19841211	JP 1983-95494	19830530

AB In the manuf. of solders such as with Pb, **Sn**, Cd, Bi, Zn, Al, In, **Au** or Ag, the molten solder is sprayed onto a cool moving surface and solidified to form 15-70.mu. thick tape. Thus, molten Pb-15% **Sn** alloy [37233-28-6] melt at 500.degree. was sprayed through a slit nozzle (12 .times. 0.3 mm dimension) onto a steel roll to manuf. the tape. Depending on the speed of roll, the tape thickness was easily controlled.

L25 ANSWER 5 OF 5 HCAPLUS COPYRIGHT 2002 ACS
AN 1981:144092 HCAPLUS
DN 94:144092
TI Preformed soft solder alloy
PA Tokyo Shibaura Electric Co., Ltd., Japan
SO Jpn. Kokai Tokkyo Koho, 3 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 56000267	A2	19810106	JP 1979-76474	19790618

AB The molten **Sn** alloy contg. Sb 5-20, **Au** 1-20, and/or Ag 3.5-20% is quenched at .gtoreq.1000.degree./s. The alloy is suitable for soldering of semiconductors to heat sinks. Thus, molten **Sn**-10% Sb [71513-06-9] alloy 100.degree. above the liquidus temp. was sprayed

from 0.5 mm diam. nozzle, and rolled between 100 mm diam. rolls, to cool at 105 .degree./s into ribbon of 0.1 .times. 3 mm section. The ribbon was placed between a 5 mm square Si and TO-3 stem, and heated at 300.degree. to form a power transistor. When heated to 150.degree. and cooled for 20,000 cycles, no trouble was obsd. due to heat fatigue. Difficulties were encountered at <20,000 cycles for the transistor soldered with the alloy cooled at <100.degree./s before rolling into a ribbon.

L29 ANSWER 1 OF 11 HCAPLUS COPYRIGHT 2002 ACS
AN 2002:574466 HCAPLUS
TI Experimental results for the extraction of essential oil from lippia sidoides cham. using pressurized carbon dioxide
AU Embd, Sousa; Chiavone-Filho, O.; Moreno, M. T.; Silva, D. N.; Marques, M. O. M.; Meireles, M. A. A.
CS UFRN, Dep. Eng. Quim. DEQ/CT, Universidade Federal do Rio Grande do Norte, Natal-RN, 59072-970, Brazil
SO Brazilian Journal of Chemical Engineering (2002), 19(2), 229-241
CODEN: BJCEFZ; ISSN: 0104-6632
PB Associacao Brasileira de Engenharia Quimica
DT Journal
LA English
AB The odoriferous species Lippia sidoides Cham. is abundant in the **Brazilian** Northeast. Its essential oil possesses antiseptic activity due to the presence of thymol. In this work, thermodn. and **kinetic** data were exptl. detd. for the CO2 + L. sidoides system. Soly. was detd. using the dynamic method at pressures of 66.7 and 78.5 bar and temps. of 283.15, 288.15, 293.15, 295.15, and 298.15 K. SFE **kinetic** data were obtained at 288.15 K and 66.7 bar. The compn. of the multicomponent solute mixt. was detd. by GC-MS and compared to the compn. of both the volatile oil obtained by steam distn. and the oleoresin obtained using ethanol. The SFE process yield was higher than the yield of either the steam distn. or the ethanol extn. The solubilities were correlated using the Peng-Robinson equation of state with one **binary** interaction parameter for the attractive term, considering the essential oil as a pseudo-component. Sovova's model quant. described the overall extn. curve.
RE.CNT 26 THERE ARE 26 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L29 ANSWER 2 OF 11 HCAPLUS COPYRIGHT 2002 ACS
AN 2002:451261 HCAPLUS
DN 137:50368
TI Die **soldering**: mechanism of the interface reaction between molten aluminum alloy and tool steel
AU Shankar, Sumanth; Apelian, Diran
CS Advanced Casting Research Center, Metal Processing Institute, WPI, Worcester, MA, 01609, USA
SO Metallurgical and Materials Transactions B: Process Metallurgy and Materials Processing Science (2002), 33B(3), 465-476
CODEN: MTBSEO; ISSN: 1073-5615
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB Die **soldering** is the result when molten aluminum sticks to the surface of the die material and remains there after the ejection of the part; it results in considerable economic and prodn. losses in the casting industry, and is a major quality detractor. In order to alleviate or mitigate die **soldering**, one must have a thorough understanding of the mechanism by which the aluminum sticks to the die material. A key question is whether the die **soldering** reaction is diffusion controlled or interface controlled. A set of diffusion couple expts. between molten aluminum alloy and the ferrous die was carried out. The results of the diffusion couple expts. showed that **soldering** is a diffusional process. When aluminum comes in contact with the ferrous die material, the iron and the aluminum atoms diffuse into each other resulting in the formation of a series of intermetallic phases over the

die material. Initially iron and aluminum react with each other to form **binary** iron-aluminum intermetallic phases. Subsequently, these phases react with the molten aluminum to further form ternary iron-aluminum-silicon intermetallic phases. Iron and aluminum have a great affinity for each other and the root cause of die **soldering** is the high reaction **kinetics**, which exists between iron and aluminum. Once the initial **binary** and ternary intermetallic phase layers are formed over the die material, the aluminum sticks to the die due to the abnormally low thermal cond. of the intermetallic phases, and due to favorable interface energies between the intermetallic layers and aluminum. The exptl. details, the results of the interface reactions, and the anal. leading to the establishment of the mechanism giving rise to die **soldering** are reviewed discussed.

RE.CNT 27 THERE ARE 27 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L29 ANSWER 3 OF 11 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:413120 HCAPLUS
DN 133:108338
TI Comparison of **brazed** joints made with BNi-1 and BNi-7 nickel-base **brazing** alloys
AU Žorc, Borut; Kosec, L.
CS Welding Institute, Ljubljana, 1000, Slovenia
SO Revista de Metalurgia (Madrid) (2000), 36(2), 100-107
CODEN: RMTGAC; ISSN: 0034-8570
PB Centro Nacional de Investigaciones Metalurgicas
DT Journal
LA English
AB Ni **brazing** alloys are produced from 3 **binary** alloy systems, i.e. Ni-P, Ni-Si, and Ni-B. In metallurgical reactions with the parent metal the brittle eutectic in the **brazing** gap may transform into a ductile solid soln. with all **brazing** alloys. **Kinetics** of the processes are different with different types of **brazing** alloys. Pptn. processes in the parent metal close to the **brazing** gap are of great importance. They control the mech. properties of the joint area when the brittle eutectic has disappeared from the gap. A comparative study of **brazed** joints on austenitic stainless alloys made with BNi-7 (Ni-P type) and BNi-1 (Ni-Si-B type) **brazing** alloys was made. **Brazing** alloys contg. P behave in a different manner to those contg. B.

RE.CNT 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L29 ANSWER 4 OF 11 HCAPLUS COPYRIGHT 2002 ACS
AN 1999:680334 HCAPLUS
DN 131:325693
TI Properties of ternary Sn-Ag-Bi **solder** alloys: Part I. Thermal properties and microstructural analysis
AU Vianco, P. T.; Rejent, J. A.
CS Center for Solder Science and Technology, Sandia National Laboratories, Albuquerque, NM, USA
SO Journal of Electronic Materials (1999), 28(10), 1127-1137
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB Bi addns. of 1% to 10% were made to the 96.5Sn-3.5Ag (wt.%) alloy in an effort to develop a Sn-Ag-Bi ternary compn. A DSC evaluation of the melting properties of the 91.84Sn-3.33Ag-4.83Bi compn. suggested the

appearance of metastable, short-range order in the at. structure as a result of low temp., thermal aging. More extensive solid-state aging studies on 91.84Sn-3.33Ag-4.83Bi/Cu couples resulted in the growth of an intermetallic compd. layer at the **solder**/substrate interface comprised of Cu3Sn and the Cu6Sn5 sub-layers. The growth **kinetics** of the total layer thickness (x) as a function of solid-state aging time (t) and temp. (T) were represented by the expression x - xo = A tn exp(-Q/RT), where x = 0.57 x 10-6 m; A = 6.22 x 10-3 m/sn; n = 0.46 .+-. 0.15; and Q = 49 .+-. 8 kJ/ mol. TEM anal. of the 91.84Sn-3.33Ag-4.83Bi compn. indicated that solid-soln. and pptn. strengthening mechanisms were a likely consequence of the Bi addns. Contact angle measurements, Cu/ **solder**/Cu **solder** joint shear strength tests, and microhardness evaluations were also performed on the Sn-Ag-Bi alloys; those results are reported in Part II.

RE.CNT 17 THERE ARE 17 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L29 ANSWER 5 OF 11 HCAPLUS COPYRIGHT 2002 ACS
AN 1998:789543 HCAPLUS
DN 130:69838
TI Contact melting of **binary** alloys under nonsteady-state diffusion conditions
AU Savintsev, S. P.
CS Nalchik, Russia
SO Metally (1998), (4), 36-40
CODEN: MEALET; ISSN: 0869-5733
PB TOO NPP "ELIZ"
DT Journal
LA Russian
AB The calcn. of the parameters of **kinetics** of contact melting of **binary** systems under nonsteady-state interdiffusion conditions (in the absence of convective mixing and without melt removal from the contact zone) is performed. The contact melting **kinetic** equations are derived. The obtained set of two transcendent equations is solved with the aid of a computer; the algorithm of the soln. is given. For the Sn-Bi and Cd-Bi systems, the values of the contact melting parameters and av. interdiffusion coeffs. in the melts are obtained. The calcd. ratios of partial velocities of contact melting for the systems selected are close to those detd. by expts.

L29 ANSWER 6 OF 11 HCAPLUS COPYRIGHT 2002 ACS
AN 1998:736193 HCAPLUS
DN 130:31622
TI Modeling the solid-state reaction between Sn-Pb **solder** and a porous substrate coating
AU Erickson, K. L.; Hopkins, P. L.; Vianco, P. T.
CS Sandia National Laboratories, Albuquerque, NM, 87185, USA
SO Journal of Electronic Materials (1998), 27(11), 1177-1192
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB **Solder** joints in hybrid microelectronic circuit electronics are formed between the **solder** alloy and the noble metal thick film conductor that has been printed and fired onto the ceramic. Although the noble metal conductors provide excellent solderability at the time of manuf., they are susceptible to solid-state reactions with Sn or other constituents of the **solder**. The reaction products consist of .gtoreq.1 intermetallic compds. (IMC). The integrity of these

solder joints can be jeopardized by formation of IMC layers, which can have thermal and mech. properties that are substantially different from the **solder** and substrate and which can consume the conductor layer by solid-state reaction. Anal. models predicting IMC growth for a variety of conditions are needed to improve predictions of long-term joint reliability and manufg. processes. Unfortunately, because of the inherent porosity of thick film conductors, IMC growth in conductors cannot be well predicted by simply applying growth **kinetics** to a quasi-one-dimensional layer geometry. Rather, IMC growth involves a complicated geometry in which the interfaces between solid-state phases grow, intersect, and coalesce. In such geometries, explicit boundary tracking, which is normally done in 1-dimensional models, is impractical. In heat transfer analyses, an implicit approach, referred to as the enthalpy method, has been used to address multidimensional problems in which interface displacement is controlled by an energy flux. However, an analogous general approach has not been available for mass transfer and reaction analyses. This paper discusses initial 2-dimensional results from a coupled exptl. and computational effort to develop a math. model and computer code that will ultimately predict 3-dimensional intermetallic growth in porous substrate-**solder** systems. The numerical model is based on an implicit interface tracking approach developed for diffusion-reaction analyses in complicated geometries. To illustrate the implicit approach with a real system, the 2-dimensional calcns. were based on the reaction couple formed between 63Sn-37Pb **solder** and 76Au-21Pt-3Pd substrates. Phys. consts. in the model were evaluated from exptl. data. Consumption of the thick film was predicted as a function of time and compared with data from independent expts.

RE.CNT 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L29 ANSWER 7 OF 11 HCAPLUS COPYRIGHT 2002 ACS
AN 1997:431886 HCAPLUS
DN 127:111946
TI Alloy design of Sn-Ag-In-Bi-Sb **solder** system using thermodynamic calculations
AU Lee, Byeong-Joo; Lee, Hyuck Mo
CS Materials Evaluation Center, Korea Research Institute of Standards and Science, Taejon, 305-600, S. Korea
SO Design & Reliability of Solders and Solder Interconnections, Proceedings of a Symposium held during the TMS Annual Meeting, Orlando, Fla., Feb. 10-13, 1997 (1997), 129-136. Editor(s): Mahidhara, Rao K. Publisher: Minerals, Metals & Materials Society, Warrendale, Pa.
CODEN: 64QHAZ
DT Conference
LA English
AB A calcn. scheme based on equil. thermodn. has been suggested for designing of Pb-free **solder** alloys. The scheme was applied to design the Sn-Ag-In-Bi-Sb **solder** alloys, considering melting behavior, wettability and mech. properties. Attempts were made to select a multicomponent alloy based on Sn-Ag **binary** eutectic, with low m.p.., small melting range, high driving force of formation for interface reaction product with Cu substrate, small values of surface tension, slow coarsening **kinetics** and without phase transformation in the service temp. range. Addn. of In and Bi was considered to decrease m.p. Sb was introduced to slow down the solid state coarsening **kinetics** . To enable the prediction of phase equil. a thermodn. database of the Sn-Ag-Zn-In-Bi-Cu-Sb 7 component system was constructed. The optimum compn. of a finally designed **solder** alloy, considering melting

L29 ANSWER 9 OF 11 HCAPLUS COPYRIGHT 2002 ACS
AN 1990:594989 HCAPLUS
DN 113:194989
TI Oxygen isotopes in iron (III) oxides. 2. Possible constraints on the depositional environment of a Precambrian quartz-hematite banded iron formation
AU Yapp, Crayton J.
CS Dep. Geol., Univ. New Mexico, Albuquerque, NM, 87131, USA
SO Chem. Geol. (1990), 85(3-4), 337-44
CODEN: CHGEAD; ISSN: 0009-2541
DT Journal
LA English
AB Quartz (Q) and hematite (Ht) possess considerably different gram formula wts. and different stoichiometric coeffs. for their O. These differences mean that the numerical values of SiO2 and Fe2O3 compns. when reported as wt. percent are not the same as the numerical values of X(O), i.e. O in the mineral as a mol percent of the total O in a **binary** Q-Ht system. Consequently, end-member Q and Ht 18O-values which are detd. from linear extrapolations of .delta.18O vs. wt.% Fe2O3 data from **binary** mixts. can be in error by as much as several per mil. Extrapolation to end-member .delta.18-O-values in **binary** Q-Ht systems should always be performed using mol fraction of O as the compositional variable. The Ht-water fractionation curve of C. J. Yapp

(1990) and the Q curve of L. P. Knauth and S. Epstein (1976) were used together with the **kinetic** isotope exchange model of R. E. Criss et al. (1987) to constrain the depositional environment of the Late Proterozoic Q-Ht banded iron formation deposits of Urucum. **Brazil** . The depositional temps. permitted by the model assumptions employed here range from 0 to .apprx.35.degree. (or 54.degree.). The permitted range of depositional water .delta.18O-values is from -6.6.permill. to 0.0.permill.. While the range of permitted depositional conditions is rather large, it does encompass the possible cool temps. and brackish or fresh waters which are indicated by sedimentol. evidence in these deposits.

L29 ANSWER 10 OF 11 HCAPLUS COPYRIGHT 2002 ACS
AN 1987:538993 HCAPLUS
DN 107:138993
TI Development of heat-resistant **brazing** alloys operating under sulfide corrosion conditions
AU Kvasnitskii, V. F.; Ermolaev, G. V.; Myal'nitsa, G. F.; Kulik, S. G.; Kasatkin, O. G.
CS Nikolaev. Korablestr. Inst., USSR
SO Avtom. Svarka (1987), (5), 66-9
CODEN: AVSVAU; ISSN: 0005-111X
DT Journal
LA Russian
AB Sulfidation corrosion in the presence of Na2SO4-25% NaCl films was investigated for **brazing** alloys at 750-950.degree.. Corrosion of VPr7 alloy by localized attack was severe at .apprx.850.degree., but VPr 11 showed resistance at higher temp. Model **binary** alloys based on Ni were evaluated at 900.degree. and compared with corrosion-resistant Ni 5-30% Cr alloys. Addn. of Al, Nb, V, and Mn to Ni to decrease the m.p. promoted hot corrosion in the **binary** Ni alloys, but Si, Zr, and Hf decreased the rate of corrosion. The results were adequate for evaluation of more complex Ni alloys contg. Cr, W, and Mo for increased heat resistance.

L29 ANSWER 11 OF 11 HCAPLUS COPYRIGHT 2002 ACS
AN 1965:422659 HCAPLUS
DN 63:22659
OREF 63:3973g-h,3974a
TI Surface and contact phenomena in metallic systems and their technological applications
AU Eremenko, V. N.
SO Poroshkovaya Met., Akad. Nauk Ukr. SSR (1965), 5(3), 42-57
DT Journal
LA Russian
AB A systematic study of surface phenomena at the boundary between fused metals and refractory compds. was carried out. The values for the free surface energy of the pure liquid metals Ga, Sn, Pb, Al, Au, Be, Pd, Pt, Fe, Co, Ni, Cr, and Rh, and several **binary** alloys were detd. The angle of wetting between the metals and several carbides, borides, carbon and diamond were also detd. **Binary** metallic systems were classified by the isotherms of the free surface energy. The interphase activity in liquid metal-solid body systems and the **kinetics** of impregnation of porous bodies with liquid metals were studied. The effects of the degree of wetting, the quantity of liquid phase, the initial porosity and the temp. on the **kinetics** of sintering in the presence of a liquid phase were also investigated. Several tech. applications of the results were suggested. New methods were described for **soldering** sintered materials with each other and with

metals. **Solders** and **soldering** methods were proposed for joining optical quartz with metals and for high-temp. **soldering** of metals with ceramics. The application of adhesively active binders for diamond grains was developed. The possibility of manufg. sintered-metal packing materials on a base of porous Fe with fusible metal fillers was shown. 76 references.

L41 ANSWER 1 OF 4 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:926157 HCAPLUS
DN 136:302526
TI Microstructure, joint strength and failure mechanism of **Sn**-Ag, **Sn**-Ag-Cu versus **Sn**-Pb-Ag **solders** in BGA packages
AU Lee, Ka Yau; Li, Ming; Olsen, Dennis R.; Chen, William T.; Tan, Ben T. C.; Mhaisalkar, Subodh
CS Institute of Materials Research and Engineering, Singapore, 117602, Singapore
SO Proceedings - Electronic Components & Technology Conference (2001), 51st, 478-485
CODEN: PETCES
PB Institute of Electrical and Electronics Engineers
DT Journal
LA English
AB The microstructure, joint strength and failure mechanisms of **Sn**-Ag and **Sn**-Ag-Cu vs. **Sn**-Pb-Ag systems on Cu/**Ni**/**Au** BGA pad metalization were studied after multiple reflow and high temp. storage. Sn-Pb-Ag system gave rise to a two-layer structure, i.e. Ni3Sn4 and (**Au**,**Ni**)Sn4, at the interface after aging at 150.degree.. However, such structure was not detected in both Pb-free systems. Only a layer of Ni3Sn4 phase in the **Sn**-Ag system and a layer of Cu-**Sn**-**Ni**-**Au** intermetallic compd. in **Sn**-Ag-Cu system were found at the interfaces, even after 1000 h at the afore-mentioned temp. The formation of the (**Au**,**Ni**)Sn4 **ternary** compd. was due to re-settlement of **Au** at the interface which led to severe brittle failure in the **Sn**-Pb-Ag system. In contrast, **Sn**-Ag and **Sn**-Ag-Cu systems failed exclusively inside the **solder** after aging at 150.degree. up to 1000 h. The **solder** ball joint strength of the three systems and failure modes were also evaluated. Both Pb-free systems showed good resistance to thermal aging with a **solder** ball joint strength maintained at .apprx.1.60 to 1.70 kgf. The **Sn**-Pb-Ag system, on the hand, degraded in mech. performance over aging time, reaching a strength .gtoreq.1.20 kgf. The growth rates of intermetallic layers at 125, 150, and 175.degree., and the activation energy were also detd.
RE.CNT 16 THERE ARE 16 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L41 ANSWER 2 OF 4 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:711941 HCAPLUS
DN 136:13503
TI Interfacial reactions between a Pb-free **solder** and die backside metallizations
AU Ghosh, G.; Pfeifer, M. J.
CS Department of Materials Science and Engineering, Northwestern University, Evanston, IL, 60208-3108, USA
SO Journal of Electronic Materials (2001), 30(9), 1145-1151
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB The interfacial reactions between **Sn**-3.0Ag-0.7Cu **solder** and backside metalizations on two semiconductor devices, field-effect transistors (FET) and diode, are studied. The metalizations on both

devices were vacuum evapd. Ti/**Ni**/Ag. The intermetallic compds. (IMC) formed near the diode/**solder** and FET/**solder** joints during reflow, and the interdiffusion processes during solid state aging are characterized by the quant. energy dispersive x-ray anal. and the x-ray mapping technique in a scanning electron microscope. Two different intermetallic compds. are found near the diode/**solder** interface. Both are in the form of particles, not a continuous layer, and are referred to as IMC-I and IMC-II. IMC-I corresponds to Ni3Sn4, with Cu atoms residing on the **Ni** sublattice. It is uncertain whether IMC-II is Cu6Sn5 or a Cu-**Ni-Sn ternary** phase. Near the as-reflowed FET/**solder** interface, both isolated scallops and a skeleton-like layer of Ni3Sn4 are obsd. The primary microstructural dynamics during solid-state aging are the coarsening of IMCs and the reactions involving the **Ni**- and Ti-layer with **Sn** and **Au**. While the reaction with the **Ni** -layer yields only Ni3Sn4 intermetallic, the reaction involving the Ti-layer suggests the formation of Ti-**Sn** and **Au**-**Sn**-Ti intermetallics. The latter is due to the diffusion of **Au** from the substrate side to the die side. It is postulated that the **kinetics** of the **Au-Sn**-Ti layer is primarily governed by the diffusion of **Au** through the Ni3Sn4 layer by a grain boundary mechanism.

RE.CNT 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L41 ANSWER 3 OF 4 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:517014 HCAPLUS
DN 135:219288
TI Dissolution and interfacial reactions of thin-film Ti/**Ni**/Ag metallizations in **solder** joints
AU Ghosh, G.
CS Department of Materials Science and Engineering, Robert R. McCormick School of Engineering and Applied Sciences, Northwestern University, Evanston, IL, 60208-3108, USA
SO Acta Materialia (2001), 49(14), 2609-2624
CODEN: ACMAFD; ISSN: 1359-6454
PB Elsevier Science Ltd.
DT Journal
LA English
AB The dissoln. and interfacial reactions involving thin-film Ti/**Ni** /Ag metalizations on two semiconductor devices, diode and metal-oxide-semiconductor field-effect transistor (MOSFET), a **Sn** -3.0Ag-0.7Cu **solder**, and a **Au**-layer on the substrates are studied. To simulate the dissoln. **kinetics** of the Ag-layer in liq. **solder** during the reflow process, the computational thermodn. (Thermo-Calc) and **kinetics** (DICTRA: DIffusion Controlled TRAnsformations) tools are employed in conjunction with the assessed thermochem. and mobility data. The simulated results are found to be consistent with the obsd. as-reflowed microstructures and the measured Ag contents in the **solder**. In the as-reflowed joints two different intermetallic compds. (IMC) are found near the diode/ **solder** interface. Both are in the form of particles of different morphologies, not a continuous layer, and are referred to as IMC-I and IMC-II. The former corresponds to Ni3Sn4 with Cu atoms residing in the **Ni** sublattice. It is uncertain whether IMC-II is Cu6Sn5 phase with **Ni** atoms residing in the Cu sublattice or a Cu-**Ni** -**Sn ternary** phase. Near the as-reflowed MOSFET/ **solder** interface, both particles and a skeleton-like layer of Ni3Sn4 are obsd. The primary microstructural dynamics during solid state

aging are the coarsening of IMC particles and the reactions involving the unconsumed (after reflow) **Ni**- and the Ti-layer with **Sn** and **Au**. While the reaction with the **Ni**-layer yields only Ni3Sn4 intermetallic, the reaction involving the Ti-layer suggests the formation of Ti-**Sn** and **Au**-**Sn**-Ti intermetallics. The latter is due to the diffusion of **Au** from the substrate side to the die side. It is postulated that the **kinetics** of **Au**-**Sn**-Ti layer is primarily governed by the diffusion of **Au** through the Ni3Sn4 layer by a grain boundary mechanism.

RE.CNT 35 THERE ARE 35 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L41 ANSWER 4 OF 4 HCAPLUS COPYRIGHT 2002 ACS
AN 1998:792062 HCAPLUS
DN 130:103454
TI Modeling the atomic transport **kinetics** in high-lead **solders**
AU Ghosh, G.; Liu, Z. K.
CS Dep. Mater. Sci. Eng., Robert R. McCormick Sch. Eng. Appl. Sci., Northwestern Univ., Evanston, IL, 60208-3108, USA
SO Journal of Electronic Materials (1998), 27(12), 1362-1366
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB The at. mobilities of **Au**, In, Pb, and **Sn** in fcc. Pb-**Sn** and Pb-In alloys are modeled using the available literature data. A set of parameters describing the compn. and temp. dependence of diffusional mobility are provided. The calcd. tracer diffusivities of Pb in **ternary** Pb-**Sn**-In and Pb-**Sn**-**Au** alloys are in very good agreement with the exptl. data. Using the model parameters, both tracer and chem. diffusivities can be calcd. in the compn. and temp. ranges where exptl. data is not available. On the assumption of local equil., the simulation of dissoln. **kinetics** of Pd in liq. Pb is demonstrated. The major source of discrepancy between the calcd. and exptl. diffusion profiles is the uncertainty of the at. transport **kinetics** data in the liq. phase. The implications of current **kinetic** modeling are discussed briefly.

RE.CNT 18 THERE ARE 18 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 1 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2002:315612 HCAPLUS
DN 137:40092
TI Reliability of **eutectic Sn**-Pb **solder** bumps and flip chip assemblies
AU Huang, Xingjia; Kallmayer, Christine; Aschenbrenner, Rolf; Lee, S.-W. Ricky
CS Department of Mechanical Engineering, Hong Kong University of Science and Technology, Hong Kong, Hong Kong
SO International Journal of Microcircuits and Electronic Packaging (2001), 24(3), 246-262
CODEN: IMEPE5; ISSN: 1063-1674
PB IMAPS - International Microelectronics and Packaging Society
DT Journal
LA English
AB This paper presents an exptl. study on the reliability of **eutectic Sn**-Pb (Sn63/Pb37) **solder** bumps and the reliability of **eutectic Sn**-Pb bumped flip chip (FC) assemblies mounted on an FR-4 substrate. The growth **kinetics** of **Sn**-Ni intermetallic compd., Ni3Sn4, on **eutectic Sn**-Pb **solder** bumped chips with Ni(P)/**Au** metalization was studied. The growth of Ni3Sn4 is proportional to the square root of thermal aging time. The activation energy of Ni3Sn4 growth was 31.23 kJ/mol (0.32 eV). Accelerated reliability tests revealed that even after 1000 cycles of the temp. cycling, the shear strength of **eutectic Sn**-Pb **solder** bumps did not change, while the shear strength showed a tendency to decrease after an extended period of high temp. storage at 125.degree.. The fracture mechanism for the shear test of **solder** bumps was a combination of fracture at the under-bump metalization/**solder** bump interface and in the bulk **solder**. For **eutectic Sn**-Pb **solder** bumped FC assemblies, accelerated reliability tests (temp. cycling (TC), high temp. storage and temp. humidity) indicated that the 1st 100 cycles or the 1st 100 h was the most crit. stage of the tests for the assemblies. In general, the temp. cycling was the most severe test. The premature failure of certain assemblies was due to weak interconnections between the bumps and the board due to cold **soldering** and small voids near the **solder** joints. For the specimens that exhibited drastic failure under the TC test, the delamination between the underfill and the passivation of the chip was the dominating mechanism.
RE.CNT 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 2 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2002:246530 HCAPLUS
DN 136:405262
TI Intermetallic compounds formed during the **soldering** reactions of **eutectic** Sn-9Zn with Cu and **Ni** substrates
AU Chan, Y. C.; Chiu, M. Y.; Chuang, T. H.
CS Department of Materials Science and Engineering, National Taiwan University, Taipei, Taiwan
SO Zeitschrift fuer Metallkunde (2002), 93(2), 95-98
CODEN: ZEMTAE; ISSN: 0044-3093
PB Carl Hanser Verlag
DT Journal
LA English
AB The efforts of this study aim to investigate the morphol. and growth **kinetics** of the intermetallic compds. formed during the

interfacial reactions of **eutectic** Sn-9Zn **solders** with
Cu and **Ni** substrates at temps. ranging from 250 to 350.degree..
Exptl. results show that the intermetallic growth rate at the Sn-9Zn/Cu
interface is much higher than that at the Sn-9Zn/**Ni** interface.
Kinetics analyses indicate that both types of interfacial
reactions are diffusion-controlled. The activation energies for the
intermetallic growth at the Sn-9Zn/Cu and Sn-9Zn/**Ni** interfaces
are 8.2 and 68.9 kJ/mol, resp. The formation mechanisms of the
intermetallic compds. during the **soldering** reactions at both
interfaces are clarified by using a Ta thin film as diffusion marker.

RE.CNT 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 3 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:926203 HCAPLUS
DN 136:192580
TI Studies on **Ni-Sn** intermetallic compound and P-rich
Ni layer at the electroless **nickel** UBM - **solder**
interface and their effects on flip chip **solder** joint
reliability
AU Jeon, Young-Doo; Paik, Kyung-Wook; Bok, Kyoung-Soon; Choi, Woo-Suk; Cho,
Chul-Lae
CS Micro-Electronic Packaging Laboratory, Dept. of Mat. Sci. and Eng., Korea
Advanced Institute of Science and Technology, Taejon, 305-701, S. Korea
SO Proceedings - Electronic Components & Technology Conference (2001), 51st,
1326-1332
CODEN: PETCES
PB Institute of Electrical and Electronics Engineers
DT Journal
LA English
AB The electroless deposited **Ni**-P under bump metallurgy (UBM) layer
was fabricated for **Sn** contg. **solder** bumps. The amt.
of P in the electroless **Ni** film was optimized by controlling
complexing agents and the pH of plating soln. And the interfacial
reaction at the electroless **Ni** UBM/**solder** interface
was studied. The intermetallic compd. (IMC) formed at the interface
during **solder** reflowing was mainly Ni3Sn4, and a P-rich
Ni layer was also formed as a byproduct of **Ni-Sn**
reaction between the **Ni-Sn** IMC and the electroless
Ni layer. A 1-4 .mu.m of Ni3Sn4 IMC and a 1800-5000 .ANG. of
P-rich **Ni** layer were formed in <10 min of **solder**
reflowing depending on **solder** materials and reflow temps.
However, <1 .mu.m thickness of the electroless **Ni** layer was
consumed. The P-rich **Ni** layer contains **Ni**, P and a
small amt. of **Sn** (.apprx.7 at.%). The at. ratio of 3Ni:1P
indicates that there is Ni3P phase in the P-rich **Ni** layer which
was verified by the x-ray anal. And no **Sn** was detected at the
electroless **Ni** layer located just below the P-rich **Ni**
layer. Therefore, the P-rich **Ni** layer, a byproduct layer of
Ni-Sn interfacial reaction, is not appropriate for a
Sn diffusion barrier at the electroless **Ni** UBM and
Sn contg. **solders**. Because of the fast diffusion of
Sn into the P-rich **Ni** layer, series of Kirkendall voids
were found in the Ni3Sn4 IMC, just above the P-rich **Ni** layer
during extended **solder** reflowing. The amt. of the Kirkendall
voids appeared to be proportional to the growth of the P-rich **Ni**
layer detd. by **solder** reflowing and subsequent annealing
processes. Because the Kirkendall voids are considered to be the main
cause of the brittle fracture, it is recommended to restrict the growth of

the P-rich **Ni** layer by choosing proper processing conditions. The growth **kinetics** of **Ni-Sn** IMC and P-rich **Ni** layer followed 3 steps: there was a rapid initial growth during the 1st 1 min of **solder** reflow followed by a reduced growth step, and finally a diffusion controlled growth. During the diffusion process, there was a linear dependence between the IMC and P-rich **Ni** layer thickness and time. Flip chip bump shear test was performed to measure the effects of the IMC and P-rich **Ni** layers on bump adhesion property. Most failure occurred at the inside of soft **solder** and partly at the Ni3Sn4 IMC. Exposed portion of the Ni3Sn4 IMC area after shearing bump surface increased, as **solder** reflow time increased. The brittle characteristics of the **Ni-Sn** IMC and the Kirkendall voids at the electroless **Ni** UBM-**Sn** contg. **solder** system cause brittle bump failure which result in a decreased bump adhesion strength.

RE.CNT 14 THERE ARE 14 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 4 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:926174 HCAPLUS
DN 136:302161
TI The **kinetics** of formation of ternary intermetallic alloys in Pb-**Sn** and Cu-Ag-**Sn** Pb-free electronic joints
AU Zribi, A.; Zavalij, L.; Borgesen, P.; Primavera, A.; Westby, G.; Cotts, E. J.
CS State University of New York at Binghamton Physics Department, Binghamton, NY, 13902, USA
SO Proceedings - Electronic Components & Technology Conference (2001), 51st, 687-692
CODEN: PETCES
PB Institute of Electrical and Electronics Engineers
DT Journal
LA English
AB A simple model of the formation of Au0.1Ni0.1Sn0.8 in Pb-**Sn** **solder/Ni** interconnects was examd. by numerical simulation. Previous exptl. observation showed that after reflow the interface consists of the Ni3Sn4 alloy between Pb-**Sn** **solder** and **Ni**, with **Au** distributed through the PbSn **solder** ball. Au0.1Ni0.1Sn0.8 forms at the Pb-**Sn** **solder**/Ni3Sn4 interface during annealing at 150.degree. in a no. of studies. The numerical simulation was used to calc. the max. flux of **Au** to the interface, and with the assumption that this **Au** was immediately incorporated in to Au0.1Ni0.1Sn0.8, a max. rate of formation of Au0.1Ni0.1Sn0.8 was calcd. This rate is similar to measured rates of formation of Au0.1Ni0.1Sn0.8 from two different studies. The formation of (CuNi)6Sn5 in **Sn**-Ag-Cu/**Ni** **solder** interconnects is discussed within the context of these observations.

RE.CNT 24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 5 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:926154 HCAPLUS
DN 136:302525
TI Characterization of lead-free **solders** and under bump metallurgies for flip-chip package
AU Lin, Jong-Kai; De Silva, Ananda; Frear, Darrel; Guo, Yifan; Jang, Jin-Wook; Li, Li; Mitchell, Dianne; Yeung, Betty; Zhang, Charles
CS Semiconductor Products Sector, Motorola Inc., Tempe, AZ, 85284, USA
SO Proceedings - Electronic Components & Technology Conference (2001), 51st,

455-462
CODEN: PETCES
PB Institute of Electrical and Electronics Engineers
DT Journal
LA English
AB A variety of Pb-free **solders** and under bump metallurgies (UBMs) were studied for flip chip packaging applications. The Sn-0.7Cu **eutectic** alloy has the best fatigue life and it possess the most desirable failure mechanism in both thermal and isothermal mech. tests regardless of UBM type. Although the electroless **Ni**-P UBM has a much slower reaction rate with **solders** than the Cu UBM, room temp. mech. fatigue is worse than on the Cu UBM when coupled with either Sn-3.8Ag-0.7Cu or Sn-3.5Ag **solder**. The Sn-37Pb **solder** consumes less Cu UBM than all other Pb-free **solders** during reflow. However, Sn-37Pb consumes more Cu after solid state annealing. Studies on aging, tensile, and shear mech. properties show that the Sn-0.7Cu alloy is the most favorable Pb-free **solder** for flip chip applications.
RE.CNT 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 6 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:711943 HCAPLUS
DN 136:13869
TI The growth of intermetallic compounds at Sn-Ag-Cu **solder**/Cu and Sn-Ag-Cu **solder/Ni** interfaces and the associated evolution of the **solder** microstructure
AU Zribi, A.; Clark, A.; Zavalij, L.; Borgesen, P.; Cotts, E. J.
CS Department of Physics and Astronomy, State University of New York at Binghamton, Binghamton, NY, USA
SO Journal of Electronic Materials (2001), 30(9), 1157-1164
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB The evolution of intermetallics at and near SnAgCu/Cu and SnAgCu/**Ni** interfaces was examd., and compared to the behavior near PbSn/metal and Sn/metal interfaces. Two different **solder** compns. were considered, Sn93.6Ag4.7Cu1.7 and Sn95.5Ag3.5Cu1.0(Sn91.8Ag5.1Cu3.1 and Sn94.35Ag3.8Cu1.85 in at. percent). In both cases, phase formation and growth at interfaces with Cu were very similar to those commonly obsd. for **eutectic** SnPb **solder**. However, the evolution of intermetallics at SnAgCu/**Ni** interfaces proved much more complex. The presence of the Cu in the **solder** dramatically altered the phase selectivity at the **solder/Ni** interface and affected the growth **kinetics** of intermetallics. As long as sufficient Cu was available, it would combine with **Ni** and Sn to form (Cu,**Ni**)6Sn5, which grew instead of the Ni3Sn4 usually obsd. in PbSn/**Ni** and Sn/**Ni** diffusion couples. This growing phase would, however, eventually consume essentially all of the available Cu in the **solder**. Because the mech. properties of Sn-Ag-Cu alloys depend upon the Cu content, this consumption can be expected to alter the mech. properties of these Pb-free **solder** joints. After depletion of the Cu from the **solder**, further annealing then gradually transformed the (Cu,**Ni**)6Sn5 phase into a (**Ni**,Cu)3Sn4 phase.
RE.CNT 24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 7 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:711942 HCAPLUS
DN 136:13868
TI Reflow **soldering** and isothermal solid-state aging of **Sn** -Ag **eutectic solder** on **Au/Ni** surface finish
AU Liu, C. M.; Ho, C. E.; Chen, W. T.; Kao, C. R.
CS Department of Chemical and Materials Engineering, National Central University, Chungli City, Taiwan
SO Journal of Electronic Materials (2001), 30(9), 1152-1156
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB The reaction between the **eutectic Sn**-3.5Ag **solder** and the **Au/Ni** surface finish during reflow as well as during isothermal aging was studied. The **Au** layer was electroplated and had a thickness of 1 .mu.m. The peak reflow temp. was fixed at 250.degree.C while the reflow time was varied between 10 s and one h. Samples that went through 90 s reflow time were then subjected to 160.degree.C isothermal aging for up to 875 h. It was found that during reflow the **Au** layer reacted very quickly with the **solder** to form AuSn4. 1 .mu.M of **Au** layer was consumed in less than 10 s. As the aging time increased, AuSn4 grains began to sep. themselves from the **Ni** layer at the roots of the grains and started to fall into the **solder**. When the reflow time reached 30 s, all the **Au** intermetallic had left the interface, and Ni3Sn4 started to form at the interface. The Ni3Sn4 growth rate followed linear **kinetics** initially (<240 s), but the growth rate slowed down afterward. During the isothermal aging, only a small amt. of (AuxNi1-x)Sn4 resettled back to the interface, and a continuous (Au0.45Ni0.55)Sn4 layer did not form at the interface, unlike the case for the **Sn**-37Pb **solder**. This is an important advantage for **Sn**-3.5Ag over **Sn**-37Pb because a continuous (Au0.45Ni0.55)Sn4 layer inevitably will weaken a **solder** joint. Our observation indicated that many (AuxNi1-x)Sn4 particles were trapped by the Ag3Sn particles, and were hindered from resettling back to the interface.
RE.CNT 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 8 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:711940 HCAPLUS
DN 136:13867
TI **Kinetics** of **Au**-containing ternary intermetallic redeposition at **solder**/UBM interface
AU Lee, Jong-Hyun; Park, Jong-Hwan; Shin, Dong-Hyuk; Lee, Yong-Ho; Kim, Yong-Seog
CS Department of Metallurgy and Materials Science, Hong Ik University, Seoul, S. Korea
SO Journal of Electronic Materials (2001), 30(9), 1138-1144
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB In this study, the effects of the under bump metallurgy (UBM) structure and Cu content in **solders** on the redeposition rate of **Au** -contg. ternary intermetallics at the **solder**/UBM interface were

investigated. A UBM structure with a **Ni** diffusion barrier, **Au**/**Ni**/Cu, appeared to promote the redeposition of ternary **Au**-contg. intermetallics at the **solder**/UBM interface of the ternary during the solid-state aging treatment and the **Au**-embrittlement of the **solder** interconnections. Copper added to the **eutectic** **Sn**-Pb and **Sn**-Ag **solders** was obsd. to be very effective in retarding the redeposition by forming the ternary intermetallics in **solder** matrixes and preventing the **Au**-embrittlement. These phenomena were discussed with the microstructures obsd.

RE.CNT 21 THERE ARE 21 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 9 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:699331 HCAPLUS
DN 135:249978
TI Growth **kinetics** and growth suppression of **Au** -containing ternary intermetallic at **solder**/UBM interface during solid-state aging
AU Lee, Jong-Hyun; Choi, Boung-Do; Lee, Yong-Ho; Kim, Yong-Seog
CS Dep. Metallurgy Materials Sci., Hong Ik Univ., Seoul, 121-791, S. Korea
SO Taehan Kumsok Hakhoechi (2001), 39(7), 814-822
CODEN: TKHCDJ; ISSN: 0253-3847
PB Korean Institute of Metals and Materials
DT Journal
LA Korean
AB In this study, effects of under bump metallurgy (UBM) structure and Cu content in **solders** on redeposition rate of **Au**-contg. ternary intermetallics at **solder**/UBM interface were investigated. A UBM structure with **Ni** diffusion barrier, **Au**/**Ni**/Cu, appeared to promote the redeposition during solid state aging treatment, leading to an **Au**-embrittlement of **solder** interconnections. Addn. of Cu into **eutectic** **Sn**-Pb and **Sn**-Ag **solders**, however, were obsd. to be very effective in retarding the redeposition and preventing the **Au**-embrittlement. These effects were discussed with the microstructures obsd.

L37 ANSWER 10 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:548110 HCAPLUS
DN 135:265464
TI Influence of interfacial reaction on reliability of QFP joints with **Sn**-Ag based Pb free **solders**
AU Hirose, Akio; Fujii, Toshio; Imamura, Takeshi; Kobayashi, Kojiro F.
CS Department of Manufacturing Science, Graduate School of Engineering, Osaka University, Suita, 565-0871, Japan
SO Materials Transactions (2001), 42(5), 794-802
CODEN: MTARCE; ISSN: 1345-9678
PB Japan Institute of Metals
DT Journal
LA English
AB QFPs (quad flat packages) with **Sn**-10Pb plated Cu lead or **Au**/Pd/**Ni** plated Cu lead were reflow-**soldered** using **Sn**-3.5Ag, **Sn**-3Ag-5Bi, **Sn**-3.5Ag-0.7Cu, **Sn**-3.5Ag-2.5Bi-2.5In and **Sn**-37Pb **solders**. The strength and the microstructure of the **solder** joints were examd. after an exposure lest at 398 K. Although the strength of the **solder** joint with the **Sn**-10Pb plated Cu lead using the **Sn** 3Ag-5Bi **solder** significantly decreased with

increasing holding time at 398 K, the strength of the other **Sn**
-Ag based **solder** joints was comparable to that with the
Sn-37Pb **solder** before and after the high temp. exposure
test. The reaction layers formed at the interface between the
solder and the Cu pad consisted of Cu6Sn5 and Cu3Sn in the joints
with **Sn**-10Pb plated Cu lead and consisted of only (Cu,**Ni**
,Pd)6Sn5 in the joints with the **Au**/Pd/**Ni** plated Cu
lead after the exposure at 398 K up to 7.2 Ms for all five **solders**
. The growth **kinetics** of the reaction layers obeyed the
parabolic law except for the joint with the **Sn**-10Pb Plated Cu
lead using the **Sn**-3Ag-5Bi **solder**, in which the growth
of the reaction layer deviated from the parabolic law and accelerated
beyond the holding time of 1.8 Ms. The unusual growth of the reaction
layer, which resulted from a liq. phase forming ahead of the reaction
layer and penetrating the grain boundaries of the reaction products,
caused the degrdn. in the strength of this **solder** joint. The
liquation was caused by the enrichment of Bi and Pb ahead of the reaction
layer during the high temp. exposure to the extent where melting occur at
the holding temp. above the **Sn**-Bi-Pb ternary **eutectic**
point of .apprx.370 K. The **Sn**-3Ag-5Bi **solder** is.
therefore, considered to be unsuitable for assembling packages with the
Sn-10Pb plated lead because of degrdn. in reliability during the
high temp. exposure >370 K.

RE.CNT 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 11 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:493261 HCAPLUS
DN 135:198812
TI Pb-free **solders** for flip-chip interconnects
AU Frear, D. R.; Jang, J. W.; Lin, J. K.; Zhang, C.
CS Interconnect Systems Laboratories at Motorola, Tempe, AZ, 85284, USA
SO JOM (2001), 53(6), 28-32, 38
CODEN: JOMMER; ISSN: 1047-4838
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB A variety of Pb-free **solder** alloys were studied for use as
flip-chip interconnects including **Sn**-3.5Ag, **Sn**-0.7Cu,
Sn-3.8Ag-0.7Cu, and **eutectic** **Sn**-37Pb as a
baseline. The reaction behavior and reliability of these **solders**
were detd. in a flip-chip configuration using a variety of under-bump
metallurgies (TiW/Cu, electrolytic **Ni**, and electroless
Ni-P/**Au**). The **solder** microstructure and
intermetallic reaction products and **kinetics** were detd. The
Sn-0.7Cu **solder** has a large grain structure and the
Sn-3.5Ag and **Sn**-3.8Ag-0.7Cu have a fine lamellar
two-phase structure of and Ag3Sn. The intermetallic compds. were similar
for all the Pb-free alloys. On **Ni**, Ni3Sn4 formed and on copper,
Cu6Sn5 and Cu3Sn formed. During reflow, the intermetallic growth rate was
faster for the Pb-free alloys, compared to **eutectic** **Sn**
-Pb. In solid-state aging, however, the interfacial intermetallic compds.
grew faster with the **tin**-lead **solder** than for the
lead-free alloys. The reliability tests performed included shear strength
and thermomech. fatigue. The lower strength **Sn**-0.7Cu alloy also
had the best thermomech. fatigue behavior. Failures occurred near the
solder/intermetallic interface for all the alloys except
Sn-0.7Cu, which deformed by grain sliding and failed in the center
of the joint. Based on this study, the optimal **solder** alloy for

flip-chip applications is identified as **eutectic Sn** -0.7Cu.
RE.CNT 33 THERE ARE 33 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 12 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:111886 HCAPLUS
DN 134:211198
TI Selective Interfacial Reaction between **Ni** and **Eutectic** BiSn Lead-Free **Solder**
AU Tao, W. H.; Chen, C.; Ho, C. E.; Chen, W. T.; Kao, C. R.
CS Department of Chemical Engineering, Chinese Culture University, Taipei, Taiwan
SO Chemistry of Materials (2001), 13(3), 1051-1056
CODEN: CMATEX; ISSN: 0897-4756
PB American Chemical Society
DT Journal
LA English
AB The chem. compatibility of the **Ni** surface with the **eutectic** BiSn lead-free **solder** was studied. According to the literature, the compd. NiBi3 is both soft and brittle and has a high growth rate when **Ni** is reacted with Bi. Therefore, it is highly undesirable for NiBi3 to form in a **solder** joint. The objective of this article is to study the reactions between **Ni** and 58Bi-42Sn in detail and to clarify whether the formation of NiBi3 will be an issue. In this study, **Ni** was reacted with the **eutectic** BiSn **solder** at 180, 240, 300, 360, and 420.degree. for times ranging from 0.5 to 48 h. At all temps. only Ni3Sn4 was detected as the reaction product. None of the other **Ni**-Sn intermetallic compds. and none of the **Ni**-Bi intermetallic compds. were obsd. The formation of only Ni3Sn4 is considered the best possible outcome from the standpoint of electronic packaging applications. At lower temps. (180, 240, and 300.degree.), Ni3Sn4 formed at the interface as a thin continuous layer, which was protective and resulted in the parabolic growth **kinetics**. However, reaction at a higher temp. (420.degree.) produced at the interface a thick reaction zone, which was a two-phase mixt. of Ni3Sn4 + **solder**. This morphol., which was nonprotective, led to the linear growth **kinetics**. The growth rates at temps. below 300.degree. were quite slow and were considered beneficial for packaging applications. The Ni3Sn4 formed near the interface had rounded edges. At locations away from the interface and inside the **solder** joint also existed a small amt. of Ni3Sn4, but this Ni3Sn4 exhibited a faceted, needle-shaped morphol. It is believed that the Ni3Sn4 with rounded edges formed during reaction, while the needle-shaped Ni3Sn4 formed during the solidification of the **solder**.
RE.CNT 16 THERE ARE 16 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 13 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:109497 HCAPLUS
DN 134:211199
TI Growth **kinetics** of intermetallic compounds in chip scale package **solder** joint
AU Tu, P. L.; Chan, Y. C.; Hung, K. C.; Lai, J. K. L.
CS Department of Department of Electronic Engineering, City University of Hong Kong, Hong Kong, Peop. Rep. China
SO Scripta Materialia (2001), 44(2), 317-323
CODEN: SCMAF7; ISSN: 1359-6462

PB Elsevier Science Inc.
DT Journal
LA English
AB A Ni3Sn4 layer and thick Cu3Sn/Cu6Sn5 intermetallic compds. were formed at **solder/Ni**-plated printed circuit boards and **solder**/Cu component-pads during **soldering** of chip-scale package components on **Au/Ni** plated substrates, resp. The **Ni-Sn** and Cu-**Sn** intermetallic compd. growth complies with following equations x(mm) = 0.9869 x 10-3 .+-. 0.0167t0.497exp(-29.54 x 103/RT), and x(mm) = 0.244 X 10-3 .+-. 1.85t0.463exp(-45.4 x 103/RT), resp. The temp. that the assembly experiences is main factor inducing the intermetallic compd. layer thicken. Estn. of the intermetallic compd. layer thickness by the equations can be used to predict the **solder** joint reliability. A 0.6 .mu.m thick **Ni-Sn** intermetallic or 2.5 .mu.m thick Cu-**Sn** intermetallic decreases the **solder** joint lifetime by .apprx.67%.
RE.CNT 17 THERE ARE 17 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 14 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2001:22859 HCAPLUS
DN 134:215400
TI Intermetallic phase formation and growth **kinetics** at the interface between molten **solder** and **Ni**-containing under bump metallization
AU Su, Peng; Korhonen, Tia; Korhonen, Matt; Li, Che-Yu
CS Department of Materials Science and Engineering, Cornell University, Ithaca, NY, 14853, USA
SO Proceedings - Electronic Components & Technology Conference (2000), 50th, 1712-1718
CODEN: PETCES
PB Institute of Electrical and Electronics Engineers
DT Journal
LA English
AB Direct Chip Attach (DCA) of Si chips to an org. substrate requires modification to the conventional Cu based Under Bump Metalization (UBM). **Ni**-contg. UBM's have proven to be able to effectively reduce the intermetallic compd. growth rate, which in turn reduces the consumption of the wetting metals in the UBM during the reaction between the **solder** and the UBM. In this research, the microstructure evolution of the interface between molten **eutectic** Pb/Sn **solder** and several alloy-foils with different Cu/**Ni** ratios is studied. The exptl. results show that the low diffusivity and dissoln. rate of **Ni** play important roles in restricting the growth of the intermetallic and changing the interface morphol. A **kinetic** model is proposed for the Intermetallic Compd. (IMC) growth based on the Cu-**Ni/solder** reaction, and is applied to analyze the data from UBM/**solder** expts.
RE.CNT 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 15 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:815962 HCAPLUS
DN 134:89468
TI Coarsening **kinetics** of Ni3Sn4 scallops during interfacial reaction between liquid **eutectic solders** and Cu/**Ni**/Pd metallization
AU Ghosh, G.

CS Department of Materials Science and Engineering, Robert R. McCormick School of Engineering and Applied Science, Northwestern University, Evanston, IL, 60208-3108, USA
SO Journal of Applied Physics (2000), 88(11), 6887-6896
CODEN: JAPIAU; ISSN: 0021-8979
PB American Institute of Physics
DT Journal
LA English
AB The thickening and radial growth **kinetics** of Ni3Sn4 scallops formed during interfacial reaction between liq. **eutectic solders** and electroplated **Ni**/Pd metalization scheme on Cu substrate is studied. Selective etching of **solder** revealed three-dimensional morphol., and the dynamical phenomena, such as faceting, competitive growth, and coalescence of Ni3Sn4 scallops during interfacial reaction. The growth **kinetics** of the Ni3Sn4 scallops in the submicron length scale was analyzed using an Arrhenius-type of equation. Both **kinetics** exhibited nonparabolic behavior with the time exponent greater than three. The thickening of the Ni3Sn4 layer during interfacial reaction was accompanied by the concomitant coarsening of the scallops. The coarsening **kinetics** during early stages of interfacial reaction was characterized by (i) a temporal law with the time exponent greater than three, (ii) a decrease in the av. no. of scallops per unit vol. with reaction time, and (iii) an increase in the std. deviation of the normalized size distribution with reaction time. The temporal laws for growth **kinetics** are discussed in terms of the effects of characteristic microstructural length scale and the existing coarsening theories. Among the coarsening theories, both the temporal law and the characteristics of radial size distributions were found to be consistent with the predictions of a recent Monte Carlo simulation of liq.-phase sintering in a two-phase system where the vol. fraction of the second phase was very high.
RE.CNT 51 THERE ARE 51 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 16 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:777370 HCAPLUS
DN 134:79618
TI Electromigration in Sn-Pb **solder** strips as a function of alloy composition
AU Liu, C. Y.; Chen, Chih; Tu, K. N.
CS Department of Materials Science and Engineering, UCLA, Los Angeles, CA, 90095-1595, USA
SO Journal of Applied Physics (2000), 88(10), 5703-5709
CODEN: JAPIAU; ISSN: 0021-8979
PB American Institute of Physics
DT Journal
LA English
AB By using thin film **solder** strips, the authors have investigated the electromigration of six different compns. of Sn-Pb **solders** at c.d. of 105 A/cm2 near ambient temp. The six compns. are pure Sn, Sn80Pb20, Sn70Pb30, Sn62Pb38 (**eutectic**), Sn40Pb60, and Sn5Pb95. The **eutectic** alloy, with the lowest m.p. and a high d. of lamella interfaces, was found to exhibit the fastest hillock growth. As the compn. moves toward the two terminal phases, the hillock growth rate decreases; but, it increases again in pure Sn. The interface between Sn and Pb, being the fastest **kinetic** path of mass transport, also serves as the place to initiate hillock and void formation.
RE.CNT 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 17 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:757942 HCAPLUS
DN 134:35759
TI Long-term aging study on the solid-state reaction between 58Bi42Sn **solder** and **Ni** substrate
AU Chen, C.; Ho, C. E.; Lin, A. H.; Luo, G. L.; Kao, C. R.
CS Department of Chemical Engineering, National Central University, Chungli City, Taiwan
SO Journal of Electronic Materials (2000), 29(10), 1200-1206
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB The reaction between **Ni** and **eutectic** BiSn **solder** at 85.degree.C, 100.degree.C, 120.degree.C, and 135.degree.C was studied. Reaction times ranging from 25 h to 3600 h were used. Only Ni3Sn4 was detected as a result of the reaction. None of the other **Ni**-Sn intermetallic compds. and none of the **Ni** -Bi intermetallic compds. were obsd. The growth of Ni3Sn4 followed diffusion-controlled **kinetics** and was very slow, with the layer thickness reaching only 16 .mu.m after 3600 h of aging at 135.degree.C. The **eutectic** BiSn microstructure coarsened very quickly. Substantial coarsening can be obsd. at 135.degree.C for only 200 h of aging. In addn., fine Bi-rich particles within the Sn-rich phase of the **solder** were found. The amt. of these fine Bi-rich particles increased with the aging temp. It is believed that the formation of these fine Bi-rich particles is due to the fact that the Sn-rich phase can dissolve substantial amts. of Bi. It was also found that, as aging time increased, the region immediately adjacent to the Ni3Sn4 layer was preferentially occupied by the Bi-rich phase. This is because Sn in that region had reacted with **Ni** to form Ni3Sn4, leaving a nearly continuous Bi-rich phase above the Ni3Sn4. Since Bi-rich alloys tend to be brittle, a nearly continuous Bi-rich phase might weaken the strength of a **solder** joint. The Ni3Sn4 grain size increased gradually from the **Ni**/Ni3Sn4 interface to the Ni3Sn4/BiSn interface, which is probably an Ostwald ripening phenomenon.
RE.CNT 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 18 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:757940 HCAPLUS
DN 134:35487
TI A comparative study of the **kinetics** of interfacial reaction between **eutectic solders** and Cu/**Ni**/Pd metallization
AU Ghosh, G.
CS Dept. of Materials Science and Engineering, Robert R. McCormick School of Engineering and Applied Science, Northwestern University, Evanston, IL, 60208-3108, USA
SO Journal of Electronic Materials (2000), 29(10), 1182-1193
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB A comparative study of the **kinetics** of interfacial reaction between the **eutectic solders** (Sn-3.5Ag, Sn-57Bi, and Sn-38Pb) and electroplated **Ni**/Pd on Cu substrate (Cu/**Ni** /NiPd/**Ni**/Pd) was performed. The interfacial microstructure was

characterized by imaging and energy dispersive x-ray anal. in scanning electron microscope (SEM). For a Pd-layer thickness of less than 75 nm, the presence or the absence of Pd-bearing intermetallic was found to be dependent on the reaction temp. In the case of Sn-3.5Ag **solder**, we did not observe any Pd-bearing intermetallic after reaction even at 230.degree.C. In the case of Sn-57Bi **solder** the PdSn4 intermetallic was obsd. after reaction at 150.degree.C and 180.degree.C, while in the case of Sn-38Pb **solder** the PdSn4 intermetallic was obsd. after reaction only at 200.degree.C. The PdSn4 grains were always dispersed in the bulk **solder** within about 10 .mu.m from the **solder**/substrate interface. At higher reaction temps., there was no Pd-bearing intermetallic due to increased soly. in the liq. **solder**. The presence or absence of Pd-bearing intermetallic was correlated with the diffusion path in the calcd. Pd-Sn-X (X = Ag, Bi, Pb) isothermal sections. In the presence of unconsumed **Ni**, only Ni3Sn4 intermetallic was obsd. at the **solder**-substrate interface by SEM. The presence of Ni3Sn4 intermetallic was consistent with the expected diffusion path based on the calcd. **Ni**-Sn-X (X = Ag, Bi, Pb) isothermal sections. Selective etching of **solders** revealed that Ni3Sn4 had a faceted scallop morphol. Both the radial growth and the thickening **kinetics** of Ni3Sn4 intermetallic were studied. In the thickness regime of 0.14 .mu.m to 1.2 .mu.m, the growth **kinetics** always yielded a time exponent n > 3 for liq.-state reaction. The temporal law for coarsensing also yielded time exponent m > 3. The apparent activation energies for thickening were: 16936J/mol for the Sn-3.5Ag **solder**, 17804 J/mol for the Sn-57Bi **solder** , and 25749 J/mol for the Sn-38Pb **solder** during liq.-state reaction. The corresponding activation energies for coarsening were very similar. However, an apparent activation energy of 37599 J/mol was obtained for the growth of Ni3Sn4 intermetallic layer during solid-state aging of the Sn-57Bi/substrate diffusion couples. The **kinetic** parameters assocd. with thickening and radial growth were discussed in terms of current theories.

RE.CNT 46 THERE ARE 46 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 19 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:757939 HCAPLUS
DN 134:35486
TI Formation and resettlement of (AuxNi1-x)Sn4 in **solder** joints of ball-grid-array packages with the **Au/Ni** surface finish
AU Ho, C. E.; Zheng, R.; Luo, G. L.; Lin, A. H.; Kao, C. R.
CS Department of Chemical Engineering, National Central University, Chungli City, Taiwan
SO Journal of Electronic Materials (2000), 29(10), 1175-1181
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB The interfacial reactions between **eutectic** PbSn **solder** and the **solder** ball pads with the **Au/Ni** surface finish were studied. **Solder** joints subjected to up to three repeated reflow-and-aging treatments were examd. For the reflow, the peak reflow temp. was 225.degree.C, and the reflow time was 115 s. Each aging process was performed at 160.degree.C for 500 h. After the first reflow, all the **Au** would disappear from the interface, and formed many (AuxNi1-x)Sn4 particles inside the **solder** joints. The value of x was between 0.99 and 0.75. In addn., there was a thin layer of Ni3Sn4 (1.4 .mu.m) at the interface. After one reflow and one

subsequent aging, most of the (AuxNi1-x)Sn4 would relocate from inside the **solder** joint to the interface, and the value of x for (AuxNi1-x)Sn4 at the interface decreased to 0.45. This (AuxNi1-x)Sn4 resettlement process repeated itself for addnl. reflow-aging cycles. More reflow-aging treatments, however, made the microstructure of (Au0.45Ni0.55)Sn4 at the interface become more non-planar. It was shown that gravitational effect was not the driving force for the resettlement of (AuxNi1-x)Sn4. It is proposed that the driving force is for (AuxNi1-x)Sn4 to seek **Ni** at the interface so that it can become more **Ni**-rich. In other words, the driving force is lowering the Gibbs energy of (AuxNi1-x)Sn4 by dissolving more **Ni**. A decompn.-diffusion mechanism is proposed to explain what happened. **Kinetic** rationales for this rapid resettlement of (AuxNi1-x)Sn4 at such a low temp. were also discussed.

RE.CNT 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 20 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:615684 HCAPLUS
DN 133:312245
TI Interfacial microstructure and the **kinetics** of interfacial reaction in diffusion couples between Sn-Pb **solder** and Cu/**Ni**/Pd metallization
AU Ghosh, G.
CS Robert R. McCormick School of Engineering and Applied Science, Department of Materials Science and Engineering, Northwestern University, Evanston, IL, 60208-3108, USA
SO Acta Materialia (2000), 48(14), 3719-3738
CODEN: ACMAFD; ISSN: 1359-6454
PB Elsevier Science Ltd.
DT Journal
LA English
AB The interfacial microstructure and **kinetics** of interfacial reaction between **eutectic** Sn-Pb **solder** and electroplated **Ni**/Pd layers on a Cu substrate have been studied by using scanning, transmission and anal. electron microscopy. Besides PdSn4 and Ni3Sn4, small grains of hexagonal Ni3Sn2 were also obsd. after long-time aging of the diffusion couples at 125.degree.. The intermetallic phases are correlated with the diffusion paths in the calcd. Pd-Pb-Sn and **Ni**-Pb-Sn isothermal sections. The growth **kinetics** of the Ni3Sn4 scallops in the submicrometer length scale was analyzed by an Arrhenius equation. The thickening **kinetics** yield a time exponent of 3.1 and apparent activation energy of 25,750 J/mol, while the radial growth **kinetics** data yield a time exponent .apprx.6.6 and apparent activation energy of 15,300 J/mol. The radial size distributions of Ni3Sn4 scallops were also quantified. The parameters describing RSDs are consistent with the theories of coarsening in two-phase systems contg. a very high vol. fraction of the second phase. Selective etching of **solder** revealed the three-dimensional morphol. of PdSn4 and Ni3Sn4, and also the dynamic phenomena, such as faceting, competitive growth and coalescence of Ni3Sn4 scallops during interfacial reaction. Non-parabolic growth **kinetics** are discussed in terms of the existing theories and characteristics of the evolving microstructure.

RE.CNT 71 THERE ARE 71 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 21 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:480846 HCAPLUS
DN 133:216354

TI **Solder** metallization interdiffusion in microelectronic interconnects
AU Zribi, A.; Chromik, R. R.; Presthus, R.; Teed, K.; Zavalij, L.; De Vita, J.; Tova, J.; Cotts, Eric J.; Clum, James A.; Erich, Robert; Primavera, A.; Westby, G.; Coyle, R. J.; Wenger, G. M.
CS Physics Department, State University of New York, Binghamton, NY, 13902-6016, USA
SO IEEE Transactions on Components and Packaging Technologies (2000), 23(2), 383-387
CODEN: ITCPFB; ISSN: 1521-3331
PB Institute of Electrical and Electronics Engineers
DT Journal
LA English
AB We investigated the growth of intermetallic compds. in Cu/**Ni**/**Au**/PbSn **solder** joints. The substrates that we investigated were **Au** plated by 1 of 2 different techniques. The **Au** finish thicknesses ranged from 0.25-2.6 .mu.m. After **solder** reflow, structural examns. using optical and electron microscopy of cross-sectioned **solder** joints revealed the growth of Ni3Sn4 at the **solder/Ni** interface after reflow. **Solder** joints with thicker layers of **Au** annealed in Ar gas at a temp. of 150.degree. for up to 450 h, displayed an appreciable growth of Au0.5Ni0.5Sn4 at the Ni3Sn4/**solder** interface. Previous investigators correlated growth of a **Au-Sn** alloy with the degrdn. of the mech. properties of the **solder** joint. The detn. of the stoichiometry of the Au0.5Ni0.5Sn4 phase provides some understanding of why this phase grew at the Ni3Sn4/**solder** interface, as **Sn**, **Au**, and **Ni** are all readily available at this interface. The growth of this ternary alloy is also consistent with trends obsd. in the **kinetics** of formation of **solder** alloys.
RE.CNT 27 THERE ARE 27 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 22 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 2000:183333 HCAPLUS
DN 132:240335
TI Effects of Cu additions on the reaction **kinetics** between Sn-based **solders** and Cu substrate
AU Kang, Dae-Woong; Huh, Joo-Youl
CS Division of Materials Science and Engineering, Korea University, Seoul, 136-701, S. Korea
SO Taehan Kumsok Hakhoechi (2000), 38(1), 180-186
CODEN: TKHCDJ; ISSN: 0253-3847
PB Korean Institute of Metals and Materials
DT Journal
LA Korean
AB The authors investigated the effects of Cu addns. to pure Sn and **eutectic** Sn-Pb **solders** on the morphol. and growth **kinetics** of the intermetallics (Cu6Sn5) and on the consumption rate of Cu substrate during isothermal reflow **soldering**. The consumption rate of Cu substrate could be reduced with increasing Cu content in both Sn and Sn-Pb **solders** up to the resp. solubilities at reflow temps. The effect of Cu addn. was more significant for the Sn **solder** which had a higher Cu soly. The Cu addn. also resulted in morphol. changes of the intermetallic layer. With increasing Cu content, the interface between Cu6Sn5 layer and **solder** roughened for pure Sn **solder** whereas it flattened for the **eutectic** Sn-Pb **solder**. When the time (t) dependence of

the intermetallic layer thickness (.hivin.X) was modelled as .hivin.X = axtn, the growth const. a appeared to increase with the Cu content whereas the growth exponent n decreased. It was shown that the growth **kinetics** of the intermetallic layer could be well interpreted by a model of grain boundary diffusion-controlled growth.

L37 ANSWER 23 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1999:736361 HCAPLUS
DN 132:71910
TI **Kinetics** of interfacial reaction between **eutectic** Sn-Pb **solder** and Cu/**Ni**/Pd metallizations
AU Ghosh, G.
CS Dept. of Materials Science and Engineering, Robert R. McCormick School of Engineering and Applied Science, Northwestern University, Evanston, IL, 60208-3108, USA
SO Journal of Electronic Materials (1999), 28(11), 1238-1250
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB The interfacial microstructure and the **kinetics** of interfacial reaction between the **eutectic** Sn-Pb **solder** and electroplated **Ni**/Pd on Cu substrate (Cu/**Ni**/NiPd/**Ni**/Pd) were studied both in the liq.- and solid-state of the **solder**. The liq.-state reaction was carried out at 200.degree., 225.degree., and 250.degree. for 30s, 60s, 150s, and 300s at each temp. The solid-state aging was carried out at 125.degree. for up to 43 days. The interfacial microstructure was characterized by imaging and energy dispersive x-ray anal. in scanning electron microscope. Depending on the thickness of the Pd-layer, both PdSn4 and PdSn3 phases were obsd. near the **solder**-substrate interface. These results were correlated with the initial thickness of the Pd-layer and the diffusion path in the calcd. Pd-Pb-Sn isothermal sections. For the aforementioned isothermal reactions, only one **Ni**-bearing intermetallic (Ni3Sn4) was obsd. at the **solder**-substrate interface. The presence of Ni3Sn4 intermetallic was consistent with the expected diffusion path based on the calcd. **Ni**-Pb-Sn isothermal sections. Selective etching of **solder** revealed that PdSn4 and PdSn3 had a faceted rod morphol., and Ni3Sn4 had a faceted scallop morphol. which gave rise to rugged Ni3Sn4-**solder** interface. Segregation of Pb on the facets of PdSn4 and PdSn3 was also obsd. The growth **kinetics** of the Ni3Sn4 intermetallic layer at the **solder**-substrate interface was analyzed using an Arrhenius-type of equation. In the thickness regime of 0.16 to 1.2 .mu.m, the growth **kinetics** yielded a time exponent n = 3.1, an apparent activation energy of 9260 J/mol both in the liq.- and solid-state of the **solder**, and a temp. dependent pre-exponential factor. The latter was attributed to the presence of one or more phases ahead of the growing layer.
RE.CNT 34 THERE ARE 34 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 24 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1999:736357 HCAPLUS
DN 132:57615
TI Reaction **kinetics** of **solder**-balls with pads in BGA packages during reflow **soldering**
AU Ho, C. E.; Chen, Y. M.; Kao, C. R.
CS Department of Chemical Engineering, National Central University, Chungli, Taiwan

SO Journal of Electronic Materials (1999), 28(11), 1231-1237
CODEN: JECMA5; ISSN: 0361-5235
PB Minerals, Metals & Materials Society
DT Journal
LA English
AB The **Au/Ni**/Cu three-layer structure is one of the most common **solder**-ball pad finishes for the ball-grid-array (BGA) packages. The 1st layer, which is to be in direct contact with the **solder**, is a 1-.mu.m **Au** layer. Beneath the **Au** layer is the **Ni** layer, whose thickness is .apprx.7 .mu.m. The Cu layer is part of the internal wiring of a BGA package. **Eutectic** PbSn **solder**-balls were reflowed on the **Au/Ni**/Cu pads at 225.degree. for reflow times from 7.5 s to 1003 s. The **Au** layer reacted very quickly with the **solder** to form AuSn4 and AuSn2. The growth rate of AuSn4 + AuSn2 was very high, approaching 1 .mu.m/s. When the reflow time reached 10 s, all the **Au** had been consumed, and AuSn2 had been converted to AuSn4. Also, AuSn4 grains began to sep. themselves from the **Ni** layer at the roots of the grains, and started to fall into the **solder**. When the reflow time reached 30 s, all AuSn4 grains had left the interface and a thin layer of Ni3Sn4 formed at the **solder** -**Ni** interface. The growth rate of this Ni3Sn4 layer was very low, reaching only 6 .mu.m for 1003 s of reflow. During reflow the **Au** layer reacted with **Sn** to form AuSn4 1st, and then broke off and fell into the molten **solder**. The **Au** layer did not dissolve into the molten **solder** directly during reflow.
RE.CNT 18 THERE ARE 18 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 25 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1999:444015 HCAPLUS
DN 131:217439
TI **Kinetic** analysis of interfacial diffusion accompanied by intermetallic compound formation
AU Kim, P. G.; Jang, J. W.; Tu, K. N.; Frear, D. R.
CS Department of Materials Science & Engineering, UCLA, Los Angeles, CA, 90095-1595, USA
SO Journal of Applied Physics (1999), 86(3), 1266-1272
CODEN: JAPIAU; ISSN: 0021-8979
PB American Institute of Physics
DT Journal
LA English
AB In interfacial reactions, a short-circuit diffusion along grain boundaries or interfaces can be accompanied by intermetallic compd. formation. The compd. penetrates the grain boundaries or the interfaces. This is a generic reliability issue for layered thin film structures because it causes a decrease in adhesion strength of the thin films. The authors have modified Fisher's grain boundary diffusion model to include this reactive **kinetic** process, and an anal. soln. was obtained. A t1/4 dependence of penetration is found, the same as Fisher's model. The important **kinetic** parameters in the solns. are a diffusion coeff. along the short-circuit path, an intrinsic interdiffusion coeff. in the compd., and a partition coeff. A comparison between the calcd. and measured data from the lateral penetration of **eutectic** SnPb **solder** along the interface between electroless **Ni** and oxysilicon nitride dielec., accompanied by Ni3Sn4 compd. formation, is given.
RE.CNT 27 THERE ARE 27 CITED REFERENCES AVAILABLE FOR THIS RECORD

ALL CITATIONS AVAILABLE IN THE RE FORMAT

L37 ANSWER 26 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1999:279703 HCAPLUS
DN 130:315179
TI Multilayer film system for **kinetically** controlled **soldering** suitable for optical subassemblies with heat-resistant bonding
IN Coult, David Gerald; Derkits, Gustav Edward, Jr.; Osenbach, John William; Wong, Yiu-man
PA Lucent Technologies Inc., USA
SO Eur. Pat. Appl., 16 pp.
CODEN: EPXXDW
DT Patent
LA English
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 911111	A2	19990428	EP 1998-308345	19981013
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
	JP 11192581	A2	19990721	JP 1998-296665	19981019
PRAI	US 1997-955686		19971022		

AB The multilayer assembly for **kinetically** controlled **soldering** contains: (a) **solder** film of **eutectic** alloy, optionally in multiple adjacent layers; (b) control interlayer as a film of transition metal for a diffusion barrier, selected from **Fe**, **Ni**, **Co**, **Pt**, or Pd; and (c) alloying metal film (preferably **Au** or Pb) to increase the **eutectic** temp. of the **solder** for heat resistant bonding. The **solder**-film assembly is suitable for joining of laser chips to optical subassemblies with heating stability in service, using **Au-Sn** alloy **solder** stabilized by diffusion alloying with addnl. **Au**. The barrier interlayer is preferably **Pt**, and can be applied as addnl. film between the **solder** and the component surface for stability in storage with oxidn. prevention. The **Au-Sn solder** film with **Pt** interlayer and **Au** alloying layer is suitable for the **soldering** with the initial melting at 350.degree., followed by rapid solidification in the mixed system. The similar results can be obtained with the **Au-Sn**-Pb or **Sn**-Pb **solder** film sepd. from the Pb alloying layer by a suitable diffusion barrier, esp. for the **soldering** of hybrid elec.-circuit assemblies.

L37 ANSWER 27 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1997:507206 HCAPLUS
DN 127:179476
TI Oxidation and reduction **kinetics** of **eutectic** SnPb, InSn and AuSn: a knowledge base for fluxless **solder** bonding applications
AU Kuhmann, J.F.; Preuss, A.; Adolphi, B.; Maly, K.; Wirth, T.; Oesterle, W.; Pittroff, W.; Weyer, G.; Fanciulli, M.
CS Mikroelektronik Centret, Copenhagen, Den.
SO Proceedings - Electronic Components & Technology Conference (1997), 47th, 120-126
CODEN: PETCES
PB Institute of Electrical and Electronics Engineers
DT Journal
LA English

AB Oxidn. **kinetics** show that growth of the native oxide, which covers the **solder** surfaces from the start of all **soldering** operations, is self-limiting. The rate of oxidn. on molten **solder** surfaces is significantly reduced by decreasing the O2 partial-pressure. According to in-situ AES, H2 can reduce **Sn** oxide as well as In oxide at moderate heating durations and temps. The oxidn. and redn. **kinetics** results are applied to flip-chip bonding expts. in vacuum with and without the injection of H2. Wetting in vacuum is excellent, but self-alignment during flip-chip **soldering** is restricted. The desired, perfectly self-aligned bonds have been only achieved by using evapd. and reflowed **Au** -20Sn and **Sn**-40Pb **solders** after the introduction of H2.

L37 ANSWER 28 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1997:431904 HCAPLUS
DN 127:129356
TI A new reliability aspect related to high density interconnections
AU Kivilahti, J.K.; Kulojarvi, K.
CS Helsinki University of Technology Materials and Manufacturing in Electronics, FIN-02150, Finland
SO Design & Reliability of Solders and Solder Interconnections, Proceedings of a Symposium held during the TMS Annual Meeting, Orlando, Fla., Feb. 10-13, 1997 (1997), 377-384. Editor(s): Mahidhara, Rao K. Publisher: Minerals, Metals & Materials Society, Warrendale, Pa.
CODEN: 64QHAZ
DT Conference
LA English
AB It is shown that with the increasing d. of interconnections, it is ever more likely that the larger fraction of **solder** mass will partake the bonding reactions - diminishing the reliability of the microjoints. Similar consequences of the miniaturization and the employment of new materials are encountered, for example, in the bump-limiting metallurgy. It was pointed out by studying the flip chip bump-**solder** -substrate interactions that the manufg. of reliable high d. interconnections implies careful control of the chem. compatibility of the contact materials. As specific examples, the interactions have been studied exptl. with **Au**- as well as with **Ni(Au**)-bumped test chips, since the systems represent metallurgically nearly extreme cases. With the help of thermodn. and **kinetic** modeling it possible to rationalize the exptl. observations on the bump-**solder**-substrate reactions. The importance of the "small **solder** vol. effect" was shown, esp. when **Sn**-based **solders** are as filler in conductive adhesives in ultra-fine pitch applications. On the basis of compatibility considerations also a feasible Pb-free soln. to the "small-vol.-problem" was addressed.

L37 ANSWER 29 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1997:338155 HCAPLUS
DN 127:74093
TI Aging studies of Cu-Sn intermetallic compounds in annealed surface mount **solder** joints
AU So, Alex C. K.; Chan, Yan C.; Lai, J. K. L.
CS Department of Electronic Engineering, City University of Hong Kong, Kowloon Tong, Hong Kong
SO IEEE Transactions on Components, Packaging, and Manufacturing Technology, Part B: Advanced Packaging (1997), 20(2), 161-166
CODEN: IMTBE4; ISSN: 1070-9894
PB Institute of Electrical and Electronics Engineers

DT Journal
LA English
AB Our previous investigation [1], revealed the formation **kinetics** and characteristics of copper-tin (Cu-Sn) intermetallic compds. (IMC) in leadless ceramic chip carrier (LCCC) surface mount **solder** joints during IR (IR)-reflow **soldering**. The present study focuses on the solid state growth of the interfacial Cu-Sn IMC in LCCC surface mount **solder** joints under prolonged annealing at elevated temp. A thick Cu-Sn IMC layer at the Sn-Pb **solder**/Cu interface of a surface mount **solder** joint (which can be achieved by prolonged aging at high temp. or after long term operation of surface mount technol. (SMT) electronic assemblies) makes the interface more sensitive to stress and may eventually lead to fatigue failure of all SMT **solder** joint. The microstructural morphol. of the Cu-Sn IMC layer at the **solder** /Cu pad interface in all annealed LCCC surface mount **solder** joints is duplex and consists of .eta.-phase Cu6Sn5 and .epsilon.-phase Cu3Sn IMC. Both Cu-Sn IMC phases thicken as the aging time increases. On the other hand, at the interface close to the component metalization, the growth of both the .eta.- and .epsilon.-phase were suppressed, with more a pronounced effect on .epsilon.-phase, by **Ni** originating from the metalization. The mean total layer thickness was found to increase linearly with the square root of aging time and the growth was faster for higher annealing temp. The activation energy for the growth of interfacial Cu-Sn IMC layers and the pre-exponential factor, D0, for diffusion were 1.09 eV and 1.68 .times. 10-4 m2/s, resp., for the 0805 LCCC surface mount **solder** joint using **eutectic** Sn-Pb **solder**. The pad size and quantity of Sn-Pb **solder** employed in LCCC surface mount **solder** joints were shown to have little effect on the solid state growth rate of interfacial Cu-Sn IMC layers.

L37 ANSWER 30 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1997:256300 HCAPLUS
DN 126:296269
TI The spreading **kinetics** of Ag-28Cu(L) on **nickel**(S). Part II. Area of spread on surfaces plated with electrolytic **Ni**
AU Weirauch, Douglas A., Jr.; Horvath, Stephen F.
CS Ceramics Technology Center, Alcoa Technical Center, Alcoa Center, PA, 15069, USA
SO Journal of Materials Research (1997), 12(4), 953-964
CODEN: JMREEE; ISSN: 0884-2914
PB Materials Research Society
DT Journal
LA English
AB Furnace **brazing** is commonly used in the electronic industry to attach I/O pins, lid-seal rings, and heat spreaders to cofired multilayer ceramic packages. Despite the widespread industry usage of electrolytic and electroless **Ni** coatings to render base metal surfaces wettable by **braze** fillers, there is no fundamental treatment of "**brazeability**" in the published literature that can be used by the materials technologist to design coatings for a given application. In this study, dynamic hot stage microscopy is used to establish the parameters that control the spreading of **eutectic** Ag-Cu **braze** on Kovar surfaces plated with electrolytic **Ni**. The effects of plating thickness, substrate type, plating annealing, and the **braze** thermal cycle are considered. A **braze** spreading mechanism developed for polycryst. **Ni** foil in Part I of this study is linked to **Ni**-plated surfaces through consideration of differences in microstructure. Eventual extension of

this improved understanding to surfaces plated with electroless **Ni** -B and **Ni**-P deposits will result in shortened product design time and improved manufg. process control.

L37 ANSWER 31 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1996:677561 HCAPLUS
DN 126:12859
TI Self-aligned, fluxless flip-chip bonding technology for photonic devices
AU Kuhmann, J. F.; Hensel, H.-J.; Pech, D.; Harde, P.; Bach, H.-G.
CS Heinrich-Hertz-Institut fur Nachrichtentechnik Berlin GmbH, Berlin, D-10587, Germany
SO Proceedings - Electronic Components & Technology Conference (1996), 46th, 1088-1092
CODEN: PETCES
PB Institute of Electrical and Electronics Engineers
DT Journal
LA English
AB The self-aligned flip-chip (FC) bonding technique is a very attractive means for the assembly of photonic devices contg. multiple optical as well as elec. waveguide interconnects. The authors propose a fluxless FC-bonding technol. which nevertheless ensures efficient **solder** oxide redn. by applying H2 (H2) under vacuum conditions. Bonding expts. were carried out in a newly developed FC-bonder of which some interesting details are reported. Reproducible bonding accuracies below the required tolerances for fiber to tapered waveguide coupling of .ltoreq.3.mu.m were achieved. Using **eutectic** Sn-lead (SnPb 60/40) **solder** and **Pt** as a wettable pad metalization these bonding results were obtained at moderate temps. (250.degree.) and heating durations (2min). A study on the oxidn. **kinetics** of molten SnPb 60/40 **solder** confirms the ability of H2 to reduce **solder** oxides when thermodn. boundary conditions are met. The leach resistance of the **Pt** thin-film metalization (300nm) was grooved by SIMS depth profiles for the required bonding temps. and durations.

L37 ANSWER 32 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1995:972002 HCAPLUS
DN 124:103000
TI Interfacial reactions with lead (Pb)-free **solders**
AU Rai, R. S.; Kang, S. K.; Purushothaman, S.
CS IBM Research Division, T.J. Watson Research Center, Yorktown Heights, NY, 10598, USA
SO Proc. - Electron. Compon. Technol. Conf. (1995), 45th, 1197-202
CODEN: PETCES
DT Journal
LA English
AB The interfacial reactions of Cu and **Ni** base metals with several Pb-free **solders** at their corresponding reflow temps. were studied. The interfacial reactions studied simulate the solid-liq. reaction which occurs during the initial **solder** joint formation as well as its rework process, if necessary. The Pb-free **solders** used in this study include: 58%Bi-42%Sn, 96.5%Sn-3.5%Ag, 95%Sn-5%Sb, and 100%Sn. The Sn/Pb **eutectic solder** is also included as a bench mark to compare the reaction **kinetics** with those of the Pb-free **solders**. The dissoln. **kinetics** of Cu and **Ni** into the Pb-free **solders** as well as the growth **kinetics** of the intermetallic phases are measured using cross-sectional metallog. of reaction couples and are compared with those obtained from the Sn/Pb **eutectic solder**.

L37 ANSWER 33 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1993:544359 HCAPLUS
DN 119:144359
TI The formation and growth of intermetallics in composite **solder**
AU Wu, Yujing; Sees, Jennifer A.; Pouraghabagher, Cyrus; Foster, L. Ann; Marshall, James L.; Jacobs, Elizabeth G.; Pinizzotto, Russell F.
CS Cent. Mater. Charact., Univ. North Texas, Denton, TX, 76203, USA
SO J. Electron. Mater. (1993), 22(7), 769-7
CODEN: JECMA5; ISSN: 0361-5235
DT Journal
LA English
AB The formation and growth of intermetallic compds. at the **solder** /substrate interface are factors affecting the solderability and reliability of electronic **solder** joints. To study the diffusion behavior and microstructural evolution of Cu-**Sn** intermetallic compds. at the composite **solder**/Cu substrate interface, the **eutectic Sn**-37% Pb **solder** and **solder** composites contg. particle addns. of Cu, Cu3Sn, Cu6Sn5, Ag, **Au**, and **Ni** were used. Annealing temps. of 110-160.degree. were used with aging times of .ltoreq.64 days. The Cu-contg. composite **solders** generally formed thinner Cu6Sn5 layers, but thicker Cu3Sn layers ~~than were formed by the **eutectic solder** alone~~. These Cu-contg. addns., therefore, resulted in increased activation energies for Cu6Sn5 formation and decreased activation energies for Cu3Sn formation compared to those of the **eutectic solder**. The activation energy for Cu3Sn formation decreased relative to that of the **eutectic solder** for Ag and **Au** composite **solders**, even though less Cu3Sn was formed at the substrate interface. **Ni** drastically reduced the Cu3Sn thickness and increased the Cu6Sn5 thickness. However, the Cu6Sn5 contained a substantial vol. fraction of voids close to the Cu substrate. Two mechanisms to explain the effects of the Cu-contg. and Ag particles on the **kinetics** of intermetallic formation were proposed. First, the particles act as **Sn** sinks which remove **Sn** from the **solder** and decrease the amt. of **Sn** available for reaction at the **solder**/substrate interface. Second, the particles reduce the cross-sectional area available for **Sn** diffusion, which also reduces the amt. of **Sn** available at the interface for reaction.

L37 ANSWER 34 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1985:30132 HCAPLUS
DN 102:30132
TI Interdiffusion of tin and copper in the copper-tin alloy electroplate system
AU Slepushkin, V. V.; Mukovnina, G. S.; Yartsev, M. G.
CS Kuibyshev. Politekh. Inst., Kuibyshev, USSR
SO Zashch. Met. (1984), 20(6), 945-9
CODEN: ZAMEA9; ISSN: 0044-1856
DT Journal
LA Russian
AB Diffusion-controlled reaction of Cu with Sn was evaluated for the cases of Cu electroplated with Sn, Sn-Co alloy, or Sn-Pb **eutectic** alloy. Formation of an intermetallic compd. at the interface was considered for Cu3Sn and Cu6Sn5. Diffusion **kinetics** were examd. at 70, 130, and 170.degree.. Results were related to the printed circuit board service. No phases based on the Co or Pb compds. with Cu were obsd. Diffusion of Sn was calcd. including that in the POS-60 [66814-44-6] and POS-40 [39412-89-0] **solder** alloy electroplates. At 70.degree.

the Cu6Sn5 showed the more rapid growth, but at 170.degree. slower, than that of Cu3Sn.

L37 ANSWER 35 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1980:412109 HCAPLUS
DN 93:12109
TI Features of the wetting of electroplates with a lead-**tin** **solder**
AU Shevchenko, V. I.; Solov'ev, L. V.; Chentsov, V. P.; Pastukhov, E. A.; Vatolin, N. A.
CS Inst. Metall., Sverdlovsk, USSR
SO Tezisy Nauchn. Soobshch. Vses. Konf. Str. Svoistvam Met. Shlakovykh Rasplavov, 3rd (1978), Volume 2, 280-3 Publisher: Akad. Nauk SSSR, Ural. Nauchn. Tsentr, Sverdlovsk, USSR.
CODEN: 43GIAR
DT Conference
LA Russian
AB The flow **kinetics** of **eutectic** Pb-**Sn** [11103-09-6] melts over electroplated **Au** on **Ni** were studied at 215-90.degree.. The substrate of Be bronze BNT-1.9 was successively electroplated with Cu and Ag or **Ni** and **Au** in 3-5 .mu. thicknesses. The wetting contact angle change with time was practically identical for Cu(3 .mu.)-Ag(3 .mu.), Cu(3 .mu.)-**Ni**(3 .mu.)-**Au**(3 .mu.). For Cu(3 .mu.)-Ag(3 .mu.)-**Au**(6 .mu.) the angle decrease proceeded slower, reaching <10.degree. in 7-8 s. The sharp wetting contact angle increase at 265.degree. was assocd. with the formation by chem. reaction of compds. with poor wettability.

L37 ANSWER 36 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1978:93575 HCAPLUS
DN 88:93575
TI Aspects of **gold-tin** bump-lead interconnection metallurgy
AU Liu, T. S.
CS Honeywell Corp. Mater. Sci. Cent., Bloomington, Minn., USA
SO Proc. Int. Microelectron. Symp. (1977) 120-6
CODEN: PIMSDY
DT Journal
LA English
AB Metallurgical interactions at the bump-lead interface were studied. For **Sn**-plated Cu leads and integrated-circuit chips with sputtered or plated **Au** bumps, interaction of liq. **Sn** with solid **Au** took place during tape automated bonding. A **Au**-rich **Au-Sn** [12785-33-0] **eutectic** structure formed. Deeper **Sn** penetration into **Au** bumps occurred at higher bonding temps. No difference in **Sn** distribution was indicated as a function of bonding pressure. Aging at 75 and 100.degree. showed a **Sn** distribution comparable to that in the as-bonded conditions. The results are discussed in terms of metallurgical phase equil., **kinetics**, and diffusion.

L37 ANSWER 37 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1974:440716 HCAPLUS
DN 81:40716
TI **Kinetics** of the displacement of flux by molten metal on the surface of a solid
AU Grigor'ev, G. A.; Lapin, V. L.
CS Mosk. Inst. Stali Splavov, Moscow, USSR
SO Izv. Vyssh. Ucheb. Zaved., Chern. Met. (1974), (3), 8-10

CODEN: IVUMAX
DT Journal
LA Russian
AB The rate of ZnCl2 flux displacement from the Cu surface by the action of molten Pb-Sn **solder** increases with increasing temp. at 350-500.degree. and for different **solder** compns. decreases in the order: **eutectic** POS-61 alloy > Pb > Pb-30% Sn. The displacement process was studied exptl. by recording the displacement oscillograms. The parameters characterizing flux displacement (relaxation time, interfacial tension of the liq. flux-molten metal interface, and equil. wetting angle) were computed.

L37 ANSWER 38 OF 38 HCAPLUS COPYRIGHT 2002 ACS
AN 1968:462954 HCAPLUS
DN 69:62954
TI Failure mechanisms associated with die-to-header bonds of planar transistors
AU Guttenplan, J. D.; Stuckenberg, F. H.
CS Autonetics Div., North Amer. Aviat., Inc., Anaheim, Calif., USA
SO Phys. Failure Electron. (1966), Volume Date 1965, 4 620-48 Avail.: CFSTI
CODEN: PFAEAA
DT Report
LA English
AB An investigation of failure mechanisms assocd. with die-to-header bonds in planar transistors involved 5 thermally-induced processes: (1) solid-state diffusion of intermediate materials into the bonding layer and (2) outgassing of materials in the header (both result in void formation); (3) intermetallic formation of NiSi and other intermetallic compds. by diffusion, which leads to cracking; (4) thermal reordering of AuSi **eutectic** alloys accompanied by changes in elec. resistance; and (5) a phase transformation in CuAu **braze** alloys, with change in elec. resistance. The **kinetics** of these processes were examd., with consideration of actual device materials and geometries, to det. their effects on transistor elec. characteristics. These processes are not major life-controlling mechanisms. Any one or a combination of these processes can result in parameter drift and incipient failure during extended device operation. Immediate corrective actions are available to prevent these deleterious effects. Thermal stabilization or outgassing steps in the device fabrication and close control of materials are suggested. Other corrective actions will require an investigation of more efficient barrier layers on the header, materials with improved wettability, or even redesigning some devices.

```
     FILE 'WPIX, JAPIO' ENTERED AT 15:02:23 ON 15 AUG 2002
L1        13234 S OPTOELECTRONIC? OR OPTO()ELECTRONIC?
L2         1771 S (U11-C18B4 OR U13-D01A OR U21-C01G)/MC
L3        26232 S (H01L-027/14 OR H03K-019/14)/IC
L4           46 S (INTERMETALLIC OR INTER()METALLIC)(2N)(SOLDER OR SOLDERING OR
L5         8724 S (GOLD OR AU) AND (TIN OR SN)
L6      1080794 S PLATINUM OR PT OR IRON OR FE OR COBALT OR CO OR NICKEL OR NI
L7        15139 S KINETIC?
L8           22 S BINARY(2N)(SOLDER OR SOLDERING OR SOLDERED OR BRAZ?)
L9           55 S (SOLDER OR SOLDERING OR SOLDERED OR BRAZE?)(2N)(QUENCH?)
L10        5300 S WET####(1N)(LAYER? OR FILM OR COAT####)
L11        3129 S ANTI()OXIDAT? OR ANTIOXIDAT?
L12     4896474 S ENCLOS### OR HOUS### OR CASE OR CONTAIN? OR PACK#####
L13      157061 S SOLDER OR SOLDERING OR SOLDERED OR BRAZ?
L14       40483 S L1-3
L15           0 S L14 AND L8
L16           0 S L14 AND L9
L17          68 S L14 AND L5
L18          36 S L17 AND L6
L19          28 S L13 AND L7
L20           1 S L19 AND (L8-11)
L21           4 S L19 AND L6
L22           3 S L21 NOT (L18 OR L20)
L23           0 S L19 AND TERNARY
L24           0 S L14 AND L4
L25           1 S L19 AND EUTECTIC
L26           0 S L25 NOT (L18 OR L20 OR L21)
L27          24 S L19 NOT (L18 OR L20 OR L21)
```

L18 ANSWER 1 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 2002-434699 [46] WPIX
CR 2001-289834 [30]; 2002-255655 [30]; 2002-280108 [32]; 2002-381601 [41]; 2002-403386 [43]; 2002-424926 [45]; 2002-434702 [46]
DNN N2002-342198 DNC C2002-123364
TI Homojunction device for use in electronic device, comprises sequentially first and second n-type, and first and second p-type compound layers formed by high vacuum plasma enhance techniques.
DC L03 U11 U12 V05
IN DMITRIEV, V A; MELNIK, Y V; NIKOLAEV, A E; VASSILEVSKI, K V
PA (TECH-N) TECHNOLOGY & DEVICES INT INC
CYC 1
PI US 2002047127 A1 20020425 (200246)* 20p
ADT US 2002047127 A1 Provisional US 1997-66940P 19971118, Div ex US 1998-195217 19981118, CIP of US 2000-638638 20000814, US 2001-860623 20010517
PRAI US 1997-66940P 19971118; US 1998-195217 19981118; US 2000-638638 20000814; US 2001-860623 20010517
AB US2002047127 A UPAB: 20020722

NOVELTY - A III-V p-n homojunction device comprises sequentially first n-type III-V compound layer grown at greater than 900 deg. C on a substrate (111), second n-type III-V compound layer, first p-type III-V compound layer, and second p-type III-V compound layer.

The p- and n-type layers are formed by high vacuum plasma enhance techniques.

DETAILED DESCRIPTION - A III-V p-n homojunction device comprises a first high temperature n-type III-V compound layer having a first band gap grown directly on a substrate. The high temperature n-type III-V compound layer is grown at greater than 900 deg. C using high vacuum plasma enhance (HVPE) techniques. A low temperature buffer layer is not interposed between the substrate and the high temperature n-type II-V compound layer. A second n-type III-V compound layer has a second band gap grown on the first n-type layer using HVPE techniques. The second gap is wider than the first gap. A first p-type III-V compound layer has a third band gap grown on the second n-type layer using HVPE techniques. It forms a p-n homojunction with the second n-type layer. A second p-type III-V compound layer has a fourth band gap grown on the first p-type layer using HVPE techniques. The fourth band gap is wider than the third band gap.

USE - As p-n homojunction device for electronic and **opto-electronic** devices.

ADVANTAGE - The device can be fabricated without requiring growth of low temperature buffer layers. It is fabricated without requiring any additional processing steps since low temperature buffer layer is not required. The first n-type layer is grown directly on the substrate without maintaining the substrate in lower temperature. The device is fabricated in simplified manner.

DESCRIPTION OF DRAWING(S) - The figure is a schematic illustration of a horizontal furnace use in the fabrication of the homojunction device.

Substrate 111

Dwg.1/24

L18 ANSWER 2 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 2002-381601 [41] WPIX
CR 2001-289834 [30]; 2002-255655 [30]; 2002-280108 [32]; 2002-403386 [43]; 2002-424926 [45]; 2002-434699 [46]; 2002-434702 [46]; 2002-443186 [47]
DNN N2002-298610 DNC C2002-107572
TI Compound semiconductor device includes high temperature n-type III-V compound layer having band gap grown directly on substrate using hydride

vapor phase epitaxy techniques.
DC L03 U11 U12
IN DMITRIEV, V A; MELNIK, Y V; NIKOLAEV, A E; VASSILEVSKI, K V
PA (TECH-N) TECHNOLOGIES & DEVICES
CYC 1
PI US 2002017650 A1 20020214 (200241)* 19p
ADT US 2002017650 A1 Provisional US 1997-66940P 19971118, Div ex US 1998-195217 19981118, CIP of US 2000-638638 20000814, US 2001-860626 20010518
FDT US 2002017650 A1 Div ex US 6218269
PRAI US 1997-66940P 19971118; US 1998-195217 19981118; US 2000-638638 20000814; US 2001-860626 20010518
AB US2002017650 A UPAB: 20020725
NOVELTY - A compound semiconductor device includes first high temperature n-type III-V compound layer having band gap grown directly on substrate using hydride vapor phase epitaxy (HVPE) techniques without interposing a low temperature buffer layer. A non-continuous quantum dot layer is formed between second n-type and first p-type compound layers.

DETAILED DESCRIPTION - A compound semiconductor device comprises first high temperature n-type III-V compound layer having first band gap. This compound layer is grown on the substrate at greater than 900 deg. C using hydride vapor phase epitaxy or HVPE techniques. A low temperature buffer layer is not interposed between the substrate and the high temperature n-type III-V compound layer. A second n-type III-V compound layer, a first p-type III-V compound layer, and a second p-type III-V compound layer are formed sequentially on top of the first high temperature n-type III-V compound layer using HVPE techniques. Each compound layer has band gap. The band gap of the second n-type compound layer is wider than that of the first n-type compound layer and the band gap of the second p-type compound layer is wider than that of the first p-type compound layer. A non-continuous quantum dot layer is formed between the second n-type compound layer and first p-type compound layer. The dot layer comprises indium-gallium-nitrogen phosphorus arsenide quantum dot regions of formula (I):
r = 1-x-y and
x+y = 0.01-0.2.

The p-type and n-type compound layers may be deposited interchangeably.

USE - Useful as semiconductor devices.

ADVANTAGE - The semiconductor device does not includes low temperature buffer layers between the substrate and epitaxial layers of III-V nitride based compound, thus its manufacturing method is simplified as additional processing steps are eliminated.

DESCRIPTION OF DRAWING(S) - The drawing shows a homojunction structure comprising an n-type GaN layer and p-type GaN layer.
N-type GaN 1001
P-type GaN 1003
Substrate 1005
Contacts 1007, 1008
Dwg.10/24

L18 ANSWER 3 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 2002-267200 [31] WPIX
DNN N2002-207725 DNC C2002-079458
TI Semiconductor package, e.g. a charged coupled device, has semiconductor chip, glass substrate, sealing material, and solder balls.
DC A85 L03 U11
IN PARK, K C
PA (TOBU-N) TOBU DENSHI KK; (PARK-I) PARK K C

CYC 2
PI US 2002008315 A1 20020124 (200231)* 11p
JP 2002118207 A 20020419 (200243) 7p
ADT US 2002008315 A1 US 2001-858408 20010516; JP 2002118207 A JP 2001-222515 20010724
PRAI KR 2000-42377 20000724
AB US2002008315 A UPAB: 20020516

NOVELTY - A semiconductor package comprises a semiconductor chip having bonding pads, and a glass substrate having metal patterns corresponding to the bonding pads. **Gold** bumps are formed on each bonding pad to connect one side of the metal patterns to the bonding pads. Solder balls are attached on the other side of the metal patterns. Sealing material seals the space between the substrate around the chip.

DETAILED DESCRIPTION - A semiconductor package includes a semiconductor chip (30), **gold** bumps (41), glass substrate (40), sealing material (42) and solder balls (43). The semiconductor chip has bonding pads (30a) respectively arranged in a line adjacent to four sides of the upper surface, and the **gold** bumps are formed on each bonding pad.

The substrate is made by forming metal patterns (35) which correspond to the bonding pads and comprise inner pattern (31), outer pattern (33) and connecting pattern (32); and forming a frame-shaped Dam (36) on the connecting pattern and on first side to surround the inner patterns. The sealing material seals the space between the substrate around the semiconductor chip to the Dam except for the outer pattern. The solder balls are attached on the outer patterns of each metal pattern.

An INDEPENDENT CLAIM is also included for fabrication of the semiconductor package.

USE - As semiconductor package.

ADVANTAGE - The inventive package is thin and reliable.

DESCRIPTION OF DRAWING(S) - The figure is a cross-sectional view of the inventive semiconductor package.

Semiconductor chip 30
Bonding pads 30a
Inner, connecting and outer patterns 31, 32, 33
Metal patterns 35
Dam 36
Glass substrate 40
Gold bumps 41
Sealing material 42
Solder balls 43
Dwg.3/5

L18 ANSWER 4 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 2002-265974 [31] WPIX
DNN N2002-206546 DNC C2002-079203
TI Light-emitting diode production involves growing light-emitting structure on temporary substrate, bonding structure to metal-coated reflective permanent substrate, and removing temporary substrate.
DC L03 U11 U12
IN CHANG, K; HORNG, R; HUANG, M; LIN, K; WEI, S; WUU, D
PA (QUAN-N) QUANXIN PHOTONICS SCITECH CO LTD; (VISU-N) VISUAL PHOTONICS EPITAXY CO LTD
CYC 2
PI US 6287882 B1 20010911 (200231)* 12p
JP 2001189490 A 20010710 (200231)# 9p
ADT US 6287882 B1 US 1999-411945 19991004; JP 2001189490 A JP 1999-369993 19991227
PRAI US 1999-411945 19991004; JP 1999-369993 19991227

AB US 6287882 B UPAB: 20020516
NOVELTY - A light-emitting diode (LED) is manufactured by growing a LED structure on a temporary substrate (42), selecting a permanent substrate (44) coated with a metal reflective mirror and adhering a LED element to the permanent substrate by a metal bonding agent (43). The temporary substrate is removed using mechanic grinding or chemical etching.
DETAILED DESCRIPTION - Manufacture of a LED involves selecting a temporary substrate to grow a LED structure on the temporary substrate. A selected permanent substrate with a reflective mirror is bonded to the LED structure by a metal bonding agent. The temporary substrate is removed using mechanic grinding or chemical etching. A plane LED element with a metal-coated reflective permanent substrate is manufactured. Two ohmic contact electrodes (411, 412) are formed on the plane LED element.
USE - For manufacturing an LED with a metal-coated reflective permanent substrate.
ADVANTAGE - The permanent substrate improves the illumination and hue of the LED. Thermal treatment is performed at lower temperature thus contamination and re-distribution of the impurity profile does not occur. The bonding tool provides pressures to the LED element and the permanent substrate, thus the applied pressure can be measured by a twisting spanner.
DESCRIPTION OF DRAWING(S) - The figures show a flow diagram of LED manufacturing by adhering an LED element to a metal-coated reflective permanent substrate.
Light emitting region 41
Temporary substrate 42
Metal bonding agent 43
Permanent substrate 44
Contact electrodes 411, 412
Dwg.4A-D/7

L18 ANSWER 5 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 2002-216386 [27] WPIX
DNN N2002-165860 DNC C2002-066106
TI Flip-chip bonding arrangement for bonding electronic component, includes under-bump portions whose sides are non-wettable by interconnecting metal and whose height determines overall separation between bonded substrates.
DC L03 U11
IN HUMPSTON, G; VINCENT, J H; WARNER, D J
PA (MAON) MARCONI CASWELL LTD
CYC 21
PI WO 2001056081 A1 20010802 (200227)* EN 29p
RW: AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE TR
W: JP US
GB 2364172 A 20020116 (200227)
ADT WO 2001056081 A1 WO 2001-GB335 20010126; GB 2364172 A GB 2001-2085 20010126
PRAI GB 2000-1918 20000127
AB WO 200156081 A UPAB: 20020429
NOVELTY - A flip-chip bonding arrangement comprises metal under-bump portion(s) attached to a first substrate and corresponding bump portions interconnecting metal attached to the under-bump portions surface remote to the first substrate. The under-bump portions have sides that are non-wettable by the interconnecting metal, and height that determines overall separation between bonded substrates.
DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:
(A) a method for providing a flip-chip bonding arrangement on a substrate (40) having bond pad(s) comprising depositing a seed layer of

conductive metal and a photoresist layer on the substrate, providing openings above the pads in the photoresist layer, depositing an under-bump layer into the openings to adhere to the seed layer, depositing the bump layer into the openings and the under-bump metal, and removing the excess photoresist and the seed layers; and

(B) a method for the flip-chip bonding of first to second substrates.

USE - For bonding electronic component, e.g. gallium arsenide monolithic microwave integrated circuit (42) to substrate.

ADVANTAGE - The use of thick metal under-bump that is non-wettable on its sides results in high yield at low cost for the arrangement. The interconnect metal bump provides a good bond between sacrificial layer (50) and wettable pad (54) in which the stand-off is primarily determined by the height of the layer. There is no flow of the interconnect metal down the sides of the under-bump for spacing member is non-wettable material.

DESCRIPTION OF DRAWING(S) - The figure is schematic sectional representations of a flip-chip bonding process.

Substrate 40

Monolithic microwave integrated circuit 42

Sacrificial layer 50

Wettable pad 54

Dwg.3a/4

L18 ANSWER 6 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 2002-114492 [15] WPIX
DNN N2002-085321 DNC C2002-035224
TI Zeolite-substrate composite comprising zeolite monolayer or multilayer bound on substrate surface for, e.g. separation of gas or liquid, comprises substrate, molecular sieve particles, and linker.
DC E19 H04 J01 J04 P73
IN CHOI, S Y; HA, G; JUN, Y S; LEE, G S; LEE, Y J; OH, G S; PARK, Y S; YOON, G B; CHOI, S; CHUN, Y; HA, K; LEE, G; LEE, Y; OH, K; PARK, Y; YOON, K B
PA (UYSO-N) UNIV SOGANG; (YOON-I) YOON K B
CYC 22
PI WO 2001096106 A1 20011220 (200215)* EN 69p
RW: AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE
W: CN JP US
KR 2001096777 A 20011108 (200226)
ADT WO 2001096106 A1 WO 2000-KR1002 20000902; KR 2001096777 A KR 2000-19667 20000414
PRAI KR 2000-19667 20000414
AB WO 200196106 A UPAB: 20020306

NOVELTY - A zeolite-substrate composite comprising a zeolite monolayer or multilayer bound on the surface of substrate comprises:

(i) substrate having hydroxyl groups, metal substrate, or polymeric substrate;

(ii) molecular sieve particles; and

(iii) linker.

The chemical bonding of the linker to the substrate and to the zeolite or its analog is by covalent-, ionic-, and coordination bonds.

DETAILED DESCRIPTION - A zeolite-substrate composite comprising zeolite monolayer or multilayer which is bound on the surface of substrate comprises:

(i) substrate consisting of substrate having hydroxyl groups, metal substrate capable of being reacted with thiol groups, or polymeric substrate having reactive functional groups in the main chain or side chains;

(ii) molecular sieve particles consisting of porous oxides, or sulfides having surface hydroxyl groups; and

(iii) linker derived from a linking compound having at least two functional groups at both terminal ends, one terminal end being chemically bonded to the substrate and the other being chemically bonded to the zeolite.

The chemical bonding of the linker to the substrate and to the zeolite of its analog is attained by covalent-, ionic-, and coordination bonds. The linker is a linking chain or a combination of linking chains derived from organic linking compound(s) consisting of Z-L-X, MR'4, R3Si-L-Y, HS-L-X, HS-L-SiR3, or HS-L-Y.

Z = -SiR3, or isocyanate;

R = halo, 1-4C alkoxy or alkyl, at least one of three R substituents being halo or alkoxy;

L = organic linking chain or linker from divalent hydrocarbon residues, optionally substituted 1-17C alkyl, aralkyl, or aryl, which may have at least one heteroatom as O, N, or S;

X = reactive functional group as halo, isocyanate, tosyl, or azide;

R' = R, at least two of the four R' substituents being halo or alkoxy;

M = Si or a transitional metal as Ti or Zr;

Y = ligand having functional group consisting of hydroxyl, thiol, amine, ammonium, sulfone and its salt, carboxylic acid and its salt, acid anhydride, epoxy, aldehyde, ester, acrylate, isocyanate, sugar residues, double bond, triple bond, diene, diyne, alkyl phosphine, or alkyl amine and the functional group can exist in the middle or at the terminal ends of the ligands.

An INDEPENDENT CLAIM is also included for a method for the preparation of a zeolite-substrate composite having a zeolite monolayer or multilayer bound on the surface of the substrate comprising:

(a) chemically combining a substrate (S) or zeolite or its analog (Z) with a linking compound (L-A) having at least two terminal functional groups to prepare a substrate-linker (S-L-A) intermediate composite or a linker-zeolite (L-B-Z) intermediate composite;

(b) chemically combining the intermediate composites with zeolite or its analog or a substrate to prepare a substrate-linker-zeolite (S-L-Z) composite, and

(c) optionally calcining the resulting composite.

USE - The zeolite monolayer and multilayer can be used in fields related to separation of gas or liquid, linear or nonlinear optical device, **opto-electronics**, membrane, membrane catalyst, sensor carrier, photocell, or film formation using a second growth of zeolite.

ADVANTAGE - The zeolite monolayer or multilayer can be formed on the surface of various substrates via chemical bond. The zeolite-substrate composite is durable and the attached zeolite particles have a lightly oriented arrangement. The thickness of zeolite layer and the repeating number of zeolite layers can be conveniently controlled.
Dwg.0/28

L18 ANSWER 7 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 2001-425043 [45] WPIX
DNN N2001-315356 DNC C2001-128534
TI Preparing patterned layer of aligned carbon nanotubes on substrate for semiconductors, includes applying polymeric material pattern on substrate using soft lithographic technique, carbonizing or synthesizing aligned carbon nanotubes layer.
DC A35 A89 E12 E36 L03 U11 U12
IN DAI, L; HUANG, S; MAU, A
PA (CSIR) COMMONWEALTH SCI & IND RES ORG
CYC 94

PI WO 2001021863 A1 20010329 (200145)* EN 26p
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
AU 2000076340 A 20010424 (200145)
ADT WO 2001021863 A1 WO 2000-AU1180 20000922; AU 2000076340 A AU 2000-76340 20000922
FDT AU 2000076340 A Based on WO 200121863
PRAI AU 1999-3041 19990923
AB WO 200121863 A UPAB: 20010813
NOVELTY - Preparing a patterned layer of aligned carbon nanotubes on a substrates using a soft lithographic technique.
DETAILED DESCRIPTION - Preparing a patterned layer of aligned carbon nanotubes on a substrate including:
(a) applying a pattern of polymeric material on the surface of a substrate capable of supporting nanotube capable of supporting nanotube growth using a soft lithographic technique;
(b) subjecting the polymeric material to carbonization to form a patterned layer of carbonized polymer on the surface of the substrate; or
(c) synthesizing a layer of aligned carbon nanotubes on regions of the substrate to which carbonized polymer is not attached to provide a patterned layer of aligned carbon nanotubes on the substrate.
INDEPENDENT CLAIMS are also included for:
(1) a patterned carbon nanotube film prepared using the claimed method;
(2) a device comprising a patterned carbon nanotube film prepared by the claimed method; and
(3) a photovoltaic cell comprising a patterned carbon nanotube film prepared by the claimed method.
USE - Used for photonic and electronic devices for use as electron field emitters in panel displays, single molecular transistors, scanning probe microscope tips, gas electrochemical energy storages, catalyst and proteins/DNA supports, artificial actuators, chemical sensors, molecular filtration membranes, energy absorbing materials, semiconductors, molecular transistors and other **opto-electronic** devices.
ADVANTAGE - Allows resolutions up to a sub-micrometer scale.
DESCRIPTION OF DRAWING(S) - Figure 2 is a schematic showing the stages involved in the preparation of a pattern layer of aligned carbon nanotubes.
Dwg.2/6

L18 ANSWER 8 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 2001-328327 [34] WPIX
DNN N2001-236251 DNC C2001-100685
TI Method of forming a coherent nanoparticle film used for electronic devices involves cross-linking nanoparticles using linker molecules and separating cross-linked nanoparticles from suspension, before completing cross-linking reaction.
DC A85 D16 L03 U11 U12
IN BRAACH-MAKSVYTIS, V L B; RAGUSE, B
PA (CSIR) COMMONWEALTH SCI & IND RES ORG
CYC 93
PI WO 2001025316 A1 20010412 (200134)* EN 38p
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TZ UG ZW

W: AE AG AL AM AT AU AZ BA BB BG BR BY CA CH CN CR CU CZ DE DK DM DZ
EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK
LR LS LT LU LV MA MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI
SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
AU 2000078902 A 20010510 (200143)

ADT WO 2001025316 A1 WO 2000-AU1210 20001005; AU 2000078902 A AU 2000-78902 20001005

FDT AU 2000078902 A Based on WO 200125316

PRAI AU 1999-3264 19991005

AB WO 200125316 A UPAB: 20010620

NOVELTY - Method of forming a coherent nanoparticle film comprises: adding linker molecules to a nanoparticle suspension which form cross-links between the nanoparticles to start a cross-linking reaction; and

separating the cross-linked nanoparticles from the suspension, prior to completion of the cross-linking reaction to obtain a coherent nanoparticle film.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(a) a method of forming a multilayer film comprising at least two layers of coherent nanoparticle film;

(b) a nanoparticle film comprising a three dimensional cross-linked array of nanoparticles and linker molecules in which the nanoparticle film is coherent, robust and self supporting; and

(c) a multi-layer film comprising at least two the nanoparticle films in which the differing nanoparticles or linkers are such that the multi-layer film has non-linear conduction properties.

USE - The nanoparticle film is used as a sensing device by interaction between the detection target and the linker molecule which links two nanoparticles. The detection target is chosen from group comprising gases, chemicals, DNA, food, and free radicals, solvents, pharmaceuticals and ions. The nanoparticle film is used as a selective filter in which selectivity is chosen by applying a positive or negative potential to allow filtration of negative or positive species respectively, through the film. The nanoparticle film is used in the formation of electronic devices such as transistors, diodes, capacitors, switches and logic gates. The nanoparticle film is used in security documents, tags, identification, monitoring and authentication. The nanoparticle film is used as a decorative coating on a variety of materials including paper, fabrics, plastics and glass. The nanoparticle film is used to form a linear actuator in order to produce macroscopic mechanical movement useful in the formation of artificial muscles or electromechanical switches. The nanoparticle film is used as a porous membrane for electro-assisted analysis and in energy conversion and storage devices such as photovoltaic cells and capacitors.

ADVANTAGE - The nanoparticle film is coherent, robust and self supporting (claimed).

Dwg.0/8

L18 ANSWER 9 OF 36 WPIX (C) 2002 THOMSON DERWENT

AN 2001-158998 [16] WPIX

DNN N2001-115897 DNC C2001-047114

TI Preparation of substrate-supported aligned carbon nanotube film for constructing devices includes synthesizing layer of aligned carbon nanotubes on substrate.

DC A85 A88 A89 E36 F01 J01 J04 L02 L03 U11 U12

IN DAI, L; HUANG, S; MAU, A; SHAOMING, H

PA (CSIR) COMMONWEALTH SCI & IND RES ORG

CYC 94

PI WO 2000073204 A1 20001207 (200116)* EN 19p

RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ
NL OA PT SD SE SL SZ TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY CA CH CN CR CU CZ DE DK DM DZ
EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK
LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG
SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
AU 2000045284 A 20001218 (200118)
EP 1198414 A2 20020424 (200235) EN
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT
RO SI
ADT WO 2000073204 A1 WO 2000-AU550 20000525; AU 2000045284 A AU 2000-45284
20000525; EP 1198414 A2 EP 2000-926581 20000525, WO 2000-AU550 20000525
FDT AU 2000045284 A Based on WO 200073204; EP 1198414 A2 Based on WO 200073204
PRAI AU 1999-650 19990528
AB WO 200073204 A UPAB: 20010323
NOVELTY - A substrate supported aligned carbon nanotube film is prepared by synthesizing a layer of the aligned carbon nanotube on a substrate. A layer of a second substrate is applied on the top of the aligned layer. The substrate is then removed to provide an aligned carbon nanotube film.
USE - For constructing multilayered structures or devices (claimed). The devices have practical applications in many areas including electron field emitters, artificial actuators, chemical sensors, gas storage, molecular-filtration membranes, nanotube capacitors, energy-absorbing materials, molecular transistors and other **optoelectronic** devices.
ADVANTAGE - The carbon nanotube film can be transferred from the substrate on which they are synthesized to other substrate. The tube can also be readily peeled off from the substrate.
Dwg.0/4

L18 ANSWER 10 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 2001-102322 [11] WPIX
DNN N2001-076001 DNC C2001-029830
TI New photolithographic process for preparing patterned layer of aligned carbon nanotubes comprises forming carbon nanotubes on a photoresist material applied onto a substrate and electromagnetically radiating the material.
DC A18 A21 A26 A85 E19 G06 J01 J04 J06 L03 U11 U12
IN DAI, L; HE, H Z; HUANG, S; MAU, A; YANG, Y Y
PA (CSIR) COMMONWEALTH SCI & IND RES ORG
CYC 94
PI WO 2000073203 A1 20001207 (200111)* EN 26p
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ
NL OA PT SD SE SL SZ TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY CA CH CN CR CU CZ DE DK DM DZ
EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK
LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG
SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
AU 2000045283 A 20001218 (200118)
EP 1200341 A1 20020502 (200236) EN
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT
RO SE SI
ADT WO 2000073203 A1 WO 2000-AU549 20000525; AU 2000045283 A AU 2000-45283
20000525; EP 1200341 A1 EP 2000-926580 20000525, WO 2000-AU549 20000525
FDT AU 2000045283 A Based on WO 200073203; EP 1200341 A1 Based on WO 200073203
PRAI AU 1999-649 19990528
AB WO 200073203 A UPAB: 20010224
NOVELTY - Preparing a patterned layer of aligned carbon nanotubes on a substrate comprises applying a layer of photoresist (1) to the substrate,

suitably masking the layer, subjecting the unmasked portion of (1) to electromagnetic radiation, developing (1) with a solvent to dissolve either transformed or untransformed portion and synthesizing the layer of carbon nanotubes on the remaining portion of (1).

DETAILED DESCRIPTION - Preparing a patterned layer of aligned carbon nanotubes on a substrate comprises:

(a) applying a layer of photoresist (1) to at least a portion of a surface of the substrate capable of supporting the nanotube growth;

(b) masking a region of the layer of (1) to provide a masked and unmasked portions;

(c) subjecting the unmasked portion of (1) to an electromagnetic radiation having a wavelength and intensity to transform the unmasked portion, while leaving the masked portion untransformed. The transformed portion exhibits solubility characteristics different then that of the untransformed portion;

(d) developing the layer of (1) by contacting with a solvent for a time and under conditions to dissolve either the transformed or untransformed portions of (1) and leave the other portion attached to the substrate; and

(e) synthesizing the patterned layer of aligned carbon nanotubes on the regions of the substrate to which the remaining portion of (1) is not attached.

INDEPENDENT CLAIMS are also included for:

(1) patterned carbon nanotubes film prepared by the process; and

(2) a device comprising the patterned carbon nanotube film.

USE - Useful in electron emitters in panel displays, field-emission transistors, single-molecular transistors, electrodes for photovoltaic cells and light emitting diodes with region-specific characteristics, **optoelectronic** elements, bismuth actuators, chemical and biological sensors with region-specific characteristic, molecular filtration membranes, region-specific energy absorbing materials, gas and electrochemical energy storage and catalyst and proteins/DNA supports.

ADVANTAGE - The process is easy to perform and provides a convenient route to patterned aligned carbon nanotubes with controllable geometries. The process allows formation of carbon nanotubes on various substrates with a micrometer or submicrometer resolution.

Dwg.0/4

L18 ANSWER 11 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 2001-082788 [10] WPIX
DNN N2001-063229 DNC C2001-024112
TI Photodetector fabrication by furnishing a multilayer structure comprising indium phosphide substrate and contact layer, undoped indium gallium arsenide absorbing layer and doped indium gallium arsenide layer.
DC L03 S03 U11 U12
IN BROWN, J J; LOO, R Y; SCHMITZ, A E
PA (HUGA) HUGHES ELECTRONICS CORP
CYC 27
PI EP 1063709 A2 20001227 (200110)* EN 11p
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI
JP 2000353819 A 20001219 (200115) 7p
US 6228673 B1 20010508 (200128)
ADT EP 1063709 A2 EP 2000-109952 20000511; JP 2000353819 A JP 2000-138348 20000511; US 6228673 B1 US 1999-311673 19990513
PRAI US 1999-311673 19990513
AB EP 1063709 A UPAB: 20010220
NOVELTY - Fabrication comprises depositing metal p-contact dot (30) onto doped layer (28), etching a mesa structure, patterning the contact layer

(24) and depositing with passive metallic n-contact layer (32), depositing polymer insulating layer (34) but not over metal dot and contact, curing polymer insulator layer and depositing metallic contact traces (36,38) on the dot and contact.

DETAILED DESCRIPTION - The contact layer is a n+ indium phosphide (InP) contact layer. The doped indium gallium arsenide (InGaAs) layer is a p+ doped. The mesa structure includes the passive metal dot, and the doped and undoped InGaAs layers. Etching is carried out using an etchant that does not attack the contact layer and substrate.

USE - Surface coupled indium gallium arsenide photodetector.

ADVANTAGE - The device has high optical power handling capability with good linearity of conversion to an electric signal and low noise. The diodes operate over a broad frequency extending into the microwave regions.

DESCRIPTION OF DRAWING(S) - The diagram shows a section of an InGaAs PIN diode.

InP substrate 22

n+ InP contact layer 24

Undoped InGaAs absorbing layer 26

p+ doped InGaAs layer 28

p-contact dot 30

Passive metallic n-contact layer 32

Polyimide insulator layer 34

Metallic traces 36,38

Dwg.1/4

L18 ANSWER 12 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 2001-015605 [02] WPIX
DNN N2001-011883 DNC C2001-004089
TI Organic electroluminescent device, e.g. light-emitting diode useful for flat panel display, has charge carrier injection layer containing complex fluoride of two different metals.
DC E12 E14 L03 U11 U12
IN KANITZ, A; STOESSEL, M
PA (SIEI) OSRAM OPTO SEMICONDUCTORS GMBH & CO OHG; (SIEI) SIEMENS AG
CYC 24
PI WO 2000057499 A1 20000928 (200102)* DE 28p
RW: AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE
W: CA CN JP KR US
EP 1171921 A1 20020116 (200207) DE
R: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
KR 2001109321 A 20011208 (200237)
CN 1344428 A 20020410 (200249)
ADT WO 2000057499 A1 WO 2000-DE783 20000313; EP 1171921 A1 EP 2000-920388 20000313, WO 2000-DE783 20000313; KR 2001109321 A KR 2001-712135 20010924; CN 1344428 A CN 2000-805374 20000313
FDT EP 1171921 A1 Based on WO 200057499
PRAI DE 1999-19913350 19990324
AB WO 200057499 A UPAB: 20010110

NOVELTY - Organic electroluminescent device, especially organic light-emitting diode, has a transparent bottom electrode on a substrate, a top metal electrode, organic functional layer(s) and a charge carrier injection layer containing a complex fluoride of 2 different metals comprising (a) lithium, sodium, potassium, magnesium or calcium and (b) magnesium, aluminum, calcium, zinc, silver, antimony, barium, samarium or ytterbium.

DETAILED DESCRIPTION - Organic electroluminescent device (OLED), especially organic light-emitting diode, has a transparent bottom electrode on a substrate, a top electrode of metal inert towards oxygen

and humidity, organic functional layer(s) between the electrodes and a charge carrier injection layer containing a complex fluoride of 2 different metals of composition (I).

(Me1)(Me2)Fm+n (I)

m, n = integers corresponding to the valencies of Me1 and Me2;

Me1 = lithium (Li), sodium (Na), potassium (K), magnesium (Mg) or calcium (Ca);

Me2 = Mg, aluminum (Al), Ca, zinc (Zn), silver (Ag), antimony (Sb), barium (Ba), samarium (Sm) or ytterbium (Yb), provided Me1 not = Me2.

USE - The organic light-emitting diodes (OLEDs) are useful for flat panel displays, e.g. for mobile and portable electronic equipment.

ADVANTAGE - The complex fluoride layer makes hermetic sealing of the top electrode unnecessary and also extends the range of materials that can be used on the cathode side.

DESCRIPTION OF DRAWING(S) - The drawing shows the OLED display described in the example.

Glass substrate 21
ITO film 22
m-TPD film 23
Alq3 film 24
LiAlF4 film 25
Top electrode of aluminum 26
Dwg.2/5

L18 ANSWER 13 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 2000-089097 [08] WPIX
DNN N2000-070111 DNC C2000-024951
TI Electroless metal deposition on silyl hydride functional resin.
DC A26 A85 L03 M13 V04 X25
IN HARKNESS, B
PA (DOWO) DOW CORNING CORP; (DOWO) DOW CORNING LTD
CYC 30
PI EP 967298 A2 19991229 (200008)* EN 10p
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI
CN 1240237 A 20000105 (200021)
JP 2000073176 A 20000307 (200023) 8p
KR 2000006068 A 20000125 (200063)
SG 77242 A1 20001219 (200106)
US 6265086 B1 20010724 (200146)
ADT EP 967298 A2 EP 1999-304489 19990609; CN 1240237 A CN 1999-110899 19990610; JP 2000073176 A JP 1999-164165 19990610; KR 2000006068 A KR 1999-21506 19990610; SG 77242 A1 SG 1999-2726 19990608; US 6265086 B1 US 1999-328086 19990608
PRAI GB 1998-12425 19980610
AB EP 967298 A UPAB: 20000215

NOVELTY - A patterned coating comprising a silyl hydride functional resin is formed on a substrate. An electroless plating solution comprising a metal ion is applied onto the coating to deposited a patterned metal film on the substrate.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for an electronic substrate having a metal film formed on its surface by the above method.

USE - The metal films are useful in the electronics industry and can be used as electrical conductors.

ADVANTAGE - High quality metal films can be formed on a wide variety of substrates by simple processes. The resultant metal films can be formed with very high resolution (down to less than 5 micron features).

Dwg.0/0

L18 ANSWER 14 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1995-327787 [42] WPIX
CR 1998-446095 [38]
DNN N1995-246671
TI Amorphous silicon colour detector with vertical-type back-to-back Schottky diodes - has Schottky junctions between metal layer and undoped amorphous silicon layer; and between transparent conductive oxide film layer and undoped amorphous silicon layer, for identifying red, blue and green lights.
DC U12 U13 W02
IN FANG, Y; KUO, L; TZENG, M
PA (INTE-N) IND TECHNOLOGY RES INST
CYC 1
PI US 5449923 A 19950912 (199542)* 13p <--
ADT US 5449923 A US 1992-861294 19920331
PRAI US 1992-861294 19920331
AB US 5449923 A UPAB: 19980923
The detector comprises a vertical-type amorphous silicon back-to-back Schottky diode (1) which has a transparent conductive oxide thin film layer (11) e.g TCO, an a-SiH layer (12), a metal layer (13) and glass (14). The diode has a total thickness of 0.9 microns and the metal layer is made from the group Cr, **Au**, Pd, Al, **Pt** and the transparent conductive oxide thin film (11) can be indium **tin** oxide, a SnO thin film or a ZnO thin film.

The depletion region of the colour detector is re-arranged in position and in content according to the absorbency of different colour lights in different bias voltages to achieve the purpose of detecting different colours. The colour detectors are arranged in a linear array with a scanning device, processor and A/D convertor processing the signals obtained.

USE/ADVANTAGE - For sensing colours and images of documents, used in fax machines or scanning machines. Requires no filter plate and has extremely fast response to light.
Dwg.1/10

L18 ANSWER 15 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1994-183713 [22] WPIX
DNN N1994-145008 DNC C1994-083302
TI Chemical deposition of metals useful in integrated circuit mfr. - using organo-metallic fluoride(s) as radiant and particle beam sensitive deposition cpds..
DC E12 L03 P84 U11
IN CAIRNS, J; THOMSON, J
PA (UYDU-N) UNIV DUNDEE
CYC 47
PI WO 9411787 A1 19940526 (199422)* 61p
RW: AT BE CH DE DK ES FR GB GR IE IT LU MC NL OA PT SE
W: AT AU BB BG BR BY CA CH CZ DE DK ES FI GB HU JP KP KR KZ LK LU MG MN MW NL NO NZ PL PT RO RU SD SE SK UA US UZ VN
AU 9455312 A 19940608 (199435)
EP 670055 A1 19950906 (199540) EN
R: AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE
JP 08507870 W 19960820 (199702) 52p
EP 670055 B1 19970514 (199724) EN 40p
R: AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE
DE 69310763 E 19970619 (199730)
US 5821017 A 19981013 (199848)

SG 65569 A1 19990622 (199935)
US 6071676 A 20000606 (200033)

ADT WO 9411787 A1 WO 1993-GB2391 19931119; AU 9455312 A AU 1994-55312 19931119; EP 670055 A1 WO 1993-GB2391 19931119, EP 1994-900242 19931119; JP 08507870 W WO 1993-GB2391 19931119, JP 1994-511896 19931119; EP 670055 B1 WO 1993-GB2391 19931119, EP 1994-900242 19931119; DE 69310763 E DE 1993-610763 19931119, WO 1993-GB2391 19931119, EP 1994-900242 19931119; US 5821017 A WO 1993-GB2391 19931119, US 1995-436394 19950818; SG 65569 A1 SG 1996-4794 19931119; US 6071676 A Div ex WO 1993-GB2391 19931119, Div ex US 1995-436394 19950818, US 1998-170346 19981013

FDT AU 9455312 A Based on WO 9411787; EP 670055 A1 Based on WO 9411787; JP 08507870 W Based on WO 9411787; EP 670055 B1 Based on WO 9411787; DE 69310763 E Based on EP 670055, Based on WO 9411787; US 5821017 A Based on WO 9411787

PRAI GB 1992-24233 19921119; GB 1993-6446 19930327; GB 1993-17750 19930826

AB WO 9411787 A UPAB: 19940722
Chemical deposition comprising: (a) applying to a substrate, a cpd. which degrades under the effect of a radiant or particle beam to produce a deposit and a degraded cpd. residue; (b) applying a selected area of the cpd. a radiant or particle beam; and (c) removing and degraded cpd. residue and unaffected cpd. from the substrate.

Where the substrate is a photomask the substrate is transparent or translucent and the deposit is opaque. The cpd. is pref. an organometallic fluoride, esp. of **Pt**, Pd, **Sn** or partic. **Au**.
The cpd is pref. tetra-sec.-butyl diaurum difluoride. The cpd. is applied by organometallic vapour deposition (OMVD) and pref. exposed to microwave radiation to drive off the solvent, before degradation using a laser beam, a UV beam and/or an electron beam. Cpds. are prepd. by adding NaF to an organometallic cpd. in the form of a chloride or bromide.

USE/ADVANTAGE - The process is useful in the mfr. of integrated circuitry, e.g. **optoelectronics** and electronic surgical implants requiring the deposition of ultra fine metal lines of submicron dimensions onto inert substrate materials, e.g. photomasks (claimed). Nanoscale deposition which is difficult to perform using conventional lithographic methods is achieved and deposition of metallic or other conductive substances, e.g. Ge, allows mfr. of integrated circuits directly onto the substrate (claimed). Photomasks having very high definition can be made, so that dense and discrete patterns can be applied.
Dwg.1/25

L18 ANSWER 16 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1993-371845 [47] WPIX
DNN N1993-287182 DNC C1993-164958
TI Laminated organic electroconductive film for (**opto**) **electronic** material - comprises films of condensed poly cyclic aromatic cpd. of benzene cpds. and doped electron donor or acceptor on base material e.g. polyester or polystyrene.
DC A26 A85 L03 U11 X12
PA (ASAH) ASAHI CHEM IND CO LTD
CYC 1
PI JP 05274919 A 19931022 (199347)* 4p
ADT JP 05274919 A JP 1992-65847 19920324
PRAI JP 1992-65847 19920324
AB JP 05274919 A UPAB: 19940111
The films comprise films of condensed polycyclic aromatic cpd. having 2-13 condensed benzene cpds. and doped electron donor or electron acceptor.

The pref condensed polycyclic aromatic cpd. is e.g., naphthalene, anthracene, naphthacene, (dibenzo-pentacene, pyrene, chrysene, perillene

or coronene. The electron acceptor is e.g., Cl2, Br2, I2, ICl, ICl3, PF5, AsF6, SF3, BCl3, SO3, HF, HCl, HNO3, H2SO4, HClO4, FSO3H, CF3SO4H, acetic or formic acid, aminoacid, FeCl3, FeOCl, TiCl4, ZrCl4, LnCl3, (Ln is La, Ce, Pr, Nd, or Sm), Cu, Cd, Cl(-), Br(-), I(-), ClO4(-), PF6(-), AsF6(-) or BF4(-). The electron donor is e.g., Li(+), Na(+), K(+), Ca(++), Sr(++), Ce- or ammonium ion or R4P(+), (R is an alkyl). The conductive film is prepd. by forming the polycyclic aromatic cpd. on a base material (e.g., a ceramic material (e.g., quartz, CaF2, sapphire, Al2O3, MgO, NaCl, KCl, SiN, AlN or BN), a semi-conductor material (e.g., silicone, Ge, Ga/As, Ga/P, In/**Sn** oxide or In/As), a metal (e.g., **Au**, Al, **Fe** or stainless steel) or an organic material (e.g., polyester, polystyrene, polyacetylene, polyacetylene or polypyrrole)) by vacuum deposition, mol. beam epitaxy or sputtering and doping the film with an electron acceptor or an electron donor.

In an example, laminated films were formed by shattering ports charged with pentacene and naphthacene on a quartz baseboard (10 mm x 10 mm x 1 mm) attached with **Au** electrode under heating under an atmospheric pressure of 2 x 10 power-7 Torr and at a baseboard temp. of 25 deg. C and a deposition rate of 1 angstrom/s. Alternately to a 15 Angstrom thick pentacene for 15 s and a 13 angstrom thick naphthacene for 13 seconds to the final thickness of 1000 angstroms. The laminated films were doped with I2 by exposing the film in satd I2 vapour in air.

USE/ADVANTAGE - The film has high conductivity and anisotropic and highly stabilised conductivity. It is used as electronic or **opto electronic** material.

Dwg.0/0

L18 ANSWER 17 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1993-242578 [30] WPIX
DNN N1993-186627 DNC C1993-108135
TI Solid-state image conversion device - for conversion of e.g. IR images includes a dot-like low resistance layer formed on an electroluminescent layer.
DC L03 S03 U14 W04
IN EBITANI, M; TOMINAGA, T
PA (NICH-N) NICHIA KAGAKU KOGYO KK
CYC 4
PI US 5229626 A 19930720 (199330)* <--
EP 562143 A1 19930929 (199339)# EN 10p
R: DE FR GB
EP 562143 B1 19970625 (199730)# EN 11p
R: DE FR GB
DE 69220563 E 19970731 (199736)#
ADT US 5229626 A US 1992-858526 19920327; EP 562143 A1 EP 1992-105228 19920326; EP 562143 B1 EP 1992-105228 19920326; DE 69220563 E DE 1992-620563 19920326, EP 1992-105228 19920326
FDT DE 69220563 E Based on EP 562143
PRAI US 1992-858526 19920327; EP 1992-105228 19920326; DE 1992-620563 19920326
AB US 5229626 A UPAB: 19931118
Device comprises transparent substrate; transparent electrode; EL layer; dot-like low resistance layer (I); photoconductive layer; and back electrode. Pref. (I) is formed of Al, **Au**, **Pt**, Zn, Ag, Cu, **Ni**, ITO, Al-doped ZnO, **Sn** oxide or a conductive transparent material.

Specifically dots of (I) have a dia. 20-300 micron, a spacing of 20-300 micron and a thickness of 0.005-5 pref. 0.1-1 micron. The dots are formed by sputtering and photoresist lift-off. The layer between the dots is an opaque insulating material pref. a mixt. of Pr6O11, Mn2O3 and Al2O3.

USE/ADVANTAGE - Esp. in conversion of non-visible radiation, including IR as well as gamma-rays and X-rays, to visible radiation. Device provides an image having high luminance with high sensitivity.
Dwg.2/6

L18 ANSWER 18 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1992-375542 [46] WPIX
DNN N1992-286252 DNC C1992-166561
TI Formation of solder bumps for use in flip-chip bonding - by depositing solder within the periphery of wettable pad and reflowing it outwards.
DC L03 M23 U11 U14 V04 V07 X24
IN HARRISON, P M; PARKER, J W; PEALL, R G; PAELL, R G
PA (NELE) NORTHERN TELECOM LTD
CYC 7
PI GB 2255672 A 19921111 (199246)* 21p
EP 517369 A2 19921209 (199250) EN 21p
R: DE FR NL SE
JP 05136152 A 19930601 (199326) 7p
EP 517369 A3 19930224 (199348)
GB 2255672 B 19941130 (199445)
US 5534442 A 19960709 (199633) 12p
EP 517369 B1 19970402 (199718) EN 12p
R: DE FR NL SE
DE 69218663 E 19970507 (199724)
ADT GB 2255672 A GB 1991-10155 19910510; EP 517369 A2 EP 1992-303982 19920501; JP 05136152 A JP 1992-117748 19920511; EP 517369 A3 EP 1992-303982 19920501; GB 2255672 B GB 1991-10155 19910510; US 5534442 A Div ex US 1992-878757 19920505, CIP of US 1993-160064 19931130, US 1994-319435 19941006; EP 517369 B1 EP 1992-303982 19920501; DE 69218663 E DE 1992-618663 19920501, EP 1992-303982 19920501
FDT DE 69218663 E Based on EP 517369
PRAI GB 1991-10155 19910510
AB GB 2255672 A UPAB: 19931006
Solder bumps for flip-chip bonding are formed by: providing a solder wettable and on a non-wettable substrate; forming a solder element on the pad within the pad edge; and reflowing so that the solder flows outward to cover the entire pad area.
The solder is pref. 80% **Au**-20% **Sn** and the solder-wettable pad is pref. formed of successive layers of Ti, **Pt** and **Au**.
Pref. the AuSn solder element is defined photo-lithographically on the pad and edge areas are etched away, pref. with HNO3/HCl, which leaves an oxide layer which is also removed before the reflow step.
USE/ADVANTAGE - Esp. in mfr. of an Si **opto-electronic** hybrid module. Method avoids possibility of droplets and debris being left outside of the wettable pad area.
4/4

L18 ANSWER 19 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1992-312421 [38] WPIX
DNN N1992-239056 DNC C1992-138772
TI Transparent organic electrode film used in **opto-electronics** - comprises condensed poly cyclic aromatic cpd. contg. condensed benzene rings and doped with electron acceptor e.g. halogen or organic acid.
DC E14 L03 P81 U12 U14 V07 X12 X15
PA (ASAH) ASAHI CHEM IND CO LTD
CYC 1
PI JP 04218209 A 19920807 (199238)* 4p

ADT JP 04218209 A JP 1990-402673 19901217
PRAI JP 1990-402673 19901217
AB JP 04218209 A UPAB: 19931113
Film comprises condensed polycyclic aromatic cpd. contg. condensed benzene rings (4-13) and doped with an electron acceptor molecule.

The condensed polycyclic aromatic cpd. is e.g., naphthacene, pentacene, heptacene, dibenzopentacene, pyrene, dibenzopyrene, chrysence, perylene, coronene, terylene, ovalene, triphenodioxadine, triphenodithiazine, triphenoselenadine, hexacen-6.15-quinone, etc.. The electron acceptor is e.g., a halogen (e.g,. Cl2, Br2, I2, ICl, ICl3, IF, etc.), a Lewis acid (e.g. PF5, AsF5, SbF5, BF3, etc.), an inorganic acid (e.g. HF, HCl, HNO3, H2SO4, HClO4, FSO3H, etc.), a protonic acid (e.g., aminoacid), an organic acid (e.g., CF3SO3H, acetic acid, formic acid, etc.), a transition metal (e.g. FeCL3, FeOCl, TiCL4, ZrCl4, WF6, etc.) or electrolytic anion (e.g., Cl-, Br-, ClO4-, PF6-, etc.).

The thin organic film is deposited on a base sheet (e.g., ceramic material (e.g., quartz glass, Al2O3), a semiconductor material (e.g. Si, Ge, In/**Sn** oxide, GaAs, InSb, GaN, etc.) a metal (**Au**, Al, Ag, **Fe**, etc.), a superconductive material (e.g,. Y-Bs(sic.)-Cu-O type, Bi-Sr-Ca-Cu-O type or Nb type) or an organic material (e.g., polyester, polystyrene, polyethylene, polyacetylene, etc.)) by vacuum deposition (e.g. by heating the aromatic cpd. under a pressure of up to 10 power (-2) Torrs, molecular beam epitaxy by employing Knudsen's cell, electron gun, gas cell, etc., chemical vapour deposition or sputtering. The doping is carried out in gaseous phase doping, liq. phase doping using liq. dopant or a dopant soln. or solid phase dipping.

USE/ADVANTAGE - The electrode film is formed at a relatively low temp. or room temp. so that it is formed on various base boards and has high stability on standing in air for a long time. It is used in (**opto**)**electronic** fields such as electroluminescent element, liq. crystalline displays, membrane switches, transparent touch panels, solar cells, cells, etc..

Dwg.0/0

L18 ANSWER 20 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1991-140670 [20] WPIX
DNN N1991-108254
TI Monolithic series and parallel connected photovoltaic module - includes interconnected sub-modules forming front contact layer carrying back contact layer disposed on thin film of semiconductor material.
DC U12 X15
IN MONGON, J; OSWALD, R; WEISS, P
PA (OSWA-I) OSWALD R; (SOLA-N) SOLAREX CORP; (STAD) AMOCO/ENRON SOLAR
CYC 5

PI	CA 2024662	A	19910309	(199120)*	
	EP 427934	A	19910522	(199121)	
	JP 03171675	A	19910725	(199136)	
	CN 1050793	A	19910417	(199202)	
	CN 1023433	C	19940105	(199518)	
	KR 9406714	B1	19940725	(199619)	
	US 5593901	A	19970114	(199709)	17p <--

ADT CA 2024662 A CA 1990-2025662 19900905; EP 427934 A EP 1990-117189 19900906; JP 03171675 A JP 1990-239808 19900910; CN 1023433 C CN 1990-108675 19900907; KR 9406714 B1 KR 1990-14181 19900908; US 5593901 A Cont of US 1989-405265 19890908, Cont of US 1991-698321 19910506, Div ex US 1994-188606 19940128, US 1995-475951 19950607
PRAI US 1989-405265 19890908; US 1991-698321 19910506; US 1994-188606 19940128; US 1995-475951 19950607

AB CA 2024662 A UPAB: 19930928
A front contact layer disposed on a substrate includes a number of segments separated by first scribe lines forming submodules with at least one of the submodules forming a module. A bus interconnects two or more of the submodules in parallel with each other. A thin film of a semiconductor material is disposed on the front contact layers.
A back contact layer is disposed on the thin film and is scribed along second scribe lines corresponding to and adjacent the first scribe lines. A unit interconnects adjacent areas of the rear and back contact layers. The thin film is scribed along third scribe lines, the interconnecting rears including a portion of the back contact layer being disposed in the third scribe lines.
ADVANTAGE - Facility of computer control for producing reproducible patterns.
2(e-g/8)

L18 ANSWER 21 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1990-045168 [07] WPIX
DNN N1990-034681 DNC C1990-019682
TI Deposition of metal chalcogenide films - by electroplating from an organic soln. contg. dissolved trifluoro-methane-sulphonate salts.
DC L03 M11 U11 U12 X15
PA (AUTE-N) AUST TELECOM COMMIS
CYC 1
PI AU 8936125 A 19891214 (199007)* 25p
ADT AU 8936125 A AU 1988-36125 19880610
PRAI AU 1988-8750 19880610; AU 1988-36125 19880610; AU 1989-36125 19890607
AB **AU 8936125A**UPAB: 19930928
Smooth, coherent binary, ternary or quaternary metal chalcogenide film in which the metal is one or more of Cd, Zn, Hg, **Co**, Cu, Mg, **Ni**, **Fe**, Bi, Tl, Ag, In, **Sn**, Mn, Ti, Mo, Ru, Hf, W, Zr, Nb and Ta, and chalcogen is one or more of S, Se and/or Te, is formed by electroplating from a bath contg. an organic solvent, a trifluoro-methane-sulphonatea salt (triplate) of the metal(s), and the chalcogen in triplate salt or elemental form. Deposition is carried out at sufficiently low current density to ensure that a smooth coherent film is deposited on the cathode.
USE/ADVANTAGE - In a range of electrical and chemical applications e.g. solar cells, **opto-electronic** devices etc.. Use of triplate salts allows a wide range of metal chalcogenides to be deposited as a smooth coherent film at mild temps. in a range of organic solvents.
1/1

L18 ANSWER 22 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1987-059235 [09] WPIX
TI Substrate for photoelectric conversion device e.g. solar cell - has first conductive film of indium and/or **tin** etc. and second conductive film of chromium and/or **nickel** etc. NoAbstract Dwg 1/3.
DC L03 U12 X15
PA (MATU) MATSUSHITA ELEC IND CO LTD
CYC 1
PI JP 62012171 A 19870121 (198709)* 2p
ADT JP 62012171 A JP 1985-150751 19850709
PRAI JP 1985-150751 19850709

L18 ANSWER 23 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1987-037333 [05] WPIX
DNN N1987-028283 DNC C1987-015780

TI Double Schottky diode light valve - comprises a semiconductor substrate with a Schottky diode on each face.
DC L03 P81 V07
IN BRAATZ, P; EFRON, U
PA (HUGA) HUGHES AIRCRAFT CO
CYC 7
PI WO 8700642 A 19870129 (198705)* EN 28p
RW: DE FR GB IT
W: JP
EP 233217 A 19870826 (198734) EN
R: DE FR GB IT
JP 62502073 W 19870813 (198738)
US 4842376 A 19890627 (198933) 7p
US 4881110 A 19891114 (199004) 6p
EP 233217 B 19910424 (199117)
R: DE FR GB IT
DE 3678942 G 19910529 (199123)
IL 79187 A 19911121 (199151)
ADT WO 8700642 A WO 1986-US1394 19860703; EP 233217 A EP 1986-904604 19860703; JP 62502073 W JP 1987-503885 19860703; US 4842376 A US 1985-758917 19850725; US 4881110 A US 1988-194352 19880516
PRAI US 1985-758917 19850725
AB WO 8700642 A UPAB: 19960108
Photosubstrate for use in light valve devices comprises: a semiconductor substrate for absorbing a beam of incident radiation and producing photogenerated majority carriers; and first and second Schottky diodes on opposite sides of the substrate for maintaining the substrate depleted of carriers.

Pref. substrate materials are Si, GaAs, InAs and InP. First Schottky diode on the incident beam side comprises a metal layer forming a high Schottky barrier, pref. **Sn** oxide, Al, **Pt** or **Au**
; or is a metallic grid array, pref. of **Pt** silicide, ITO or
Pt. Second diode on the second side orineted to reflect a second incident beam is also formed of a metallic grid.

USE/ADVANTAGE - In image processing, image conversion, real time data processing etc.. Light valve provides improved output uniformity, higher resolution and higher yield.
1/1
Dwg.1/1

L18 ANSWER 24 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1985-136090 [23] WPIX
DNN N1985-102356 DNC C1985-059233
TI Picture converter for reading information - has electrodes and photoconductor layer with photoconductor particles dispersed in resin binder.
DC A89 G08 L03 U12 U13 U14 W02
IN KATOH, S; OKIBAYASHI, K
PA (SHAF) SHARP KK
CYC 4
PI DE 3442367 A 19850530 (198523)* 16p
GB 2150351 A 19850626 (198526)
JP 60111461 A 19850617 (198530)
US 4650985 A 19870317 (198713)
GB 2150351 B 19871125 (198747)
DE 3442367 C 19900208 (199006)
ADT DE 3442367 A DE 1984-3442367 19841120; GB 2150351 A GB 1984-29543 19841122; JP 60111461 A JP 1983-219881 19831122; US 4650985 A US 1984-670869 19841113

PRAI JP 1983-219881 19831122
AB DE 3442367 A UPAB: 19930925
Picture converter for reading information consists of a light-transmitting, insulating substrate (1); a pair of opposite electrodes (2, 2) on the substrate; and a photoconducting layer (3) on the substrate and electrodes, which consists of photo-conducting particles (I), dispersed in a resin binder (II).
Pref. (I) have a dia. of 0.5-5 microns and comprise 65-90 wt.% of the photoconducting layer. Pref. (I) consist of II/VI cpds., pref. CdSe, CdS, ZnS, ZnSe, ZnO, HgS, HgSe or HgTe; III/V cpds.; or IV substances; esp. CdSe. (II) is an organic resin, pref. acrylic, melamine, styrene, polyester, or silicone resin. The electrodes consist of Al, Ti, **Au**
, Ag, Cr, **Ni**, **Pt**, **Sn**, SnO2 or In-**Sn**
oxide.
USE/ADVANTAGE - The converter is useful with cele-copiers, intelligent copiers, etc. It has improved light response properties, output signal strength, signal/noise ratio etc., and can convert the image information correctly and accurately into electric signals. Ic can be made at least as long as an original document.
1/1

L18 ANSWER 25 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1983-29507K [12] WPIX
DNN N1983-053337 DNC C1983-028932
TI Optical waveguides in semiconductors - are defined by metal diffused regions formed at temp. not deteriorating substrate surface.
DC L03 P81 U11 U12 V07
IN ALFERNESS, R C; KAMINOW, I P
PA (AMTT) BELL TELEPHONE LAB INC
CYC 5
PI US 4376138 A 19830308 (198312)* 6p
DE 3300132 A 19830721 (198330)
GB 2113006 A 19830727 (198330)
JP 58120208 A 19830718 (198334)
GB 2113006 B 19850904 (198536)
CA 1204369 A 19860513 (198624)
ADT GB 2113006 A GB 1982-35869 19821216
PRAI US 1982-336598 19820104
AB US 4376138 A UPAB: 19930925
An optical waveguide is formed in semiconductor material, pref. InP or InGaAsP, by (a) depositing a patterned processing layer on the semiconductor surface to define the waveguide region; (b) maintaining the semiconductor at at least 400 deg.C. for at least 1 hr.; and (c) during (part of) the time (b), contacting (part of) the semiconductor with metal ats. from Si, Ge, **Sn**, Te, Se, As, P, Sb, Cd, Zn, In, Ga, Al, **Fe**, Cr, Cu, Ag or **Au**, so the metal diffuses into the semiconductor, defining an optical waveguide.
The processing layer may be a metal layer, so the metal ats. of (c) are derived from the processing layer. The waveguide region may be defined by a negative patterned process layer, esp. using **Au** or Ge, or by a positive patterned process layer, esp. using **Fe** or Cr. Alternatively, the process layer is a nonmetal, and the ats. of (c) are derived from a metal-cpd.contg. process. atmos.
Metal at. diffused strip waveguides are formed without deteriorating the semiconductor surface, esp. for 1-1.6 micron infrared radiation.

L18 ANSWER 26 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1981-66909D [37] WPIX
TI Photoelectric conversion device mfr. - includes forming (semi) insulating

film on electrode and forming semiconductor layer on insulating film.
DC L03 U12 U14 X15
PA (YAMA-I) YAMAZAKI S
CYC 2
PI JP 56093375 A 19810728 (198137)* 6p
US 4403239 A 19830906 (198338)
PRAI JP 1979-169941 19791226
AB JP 56093375 A UPAB: 19930915
An electrode is formed on an insulating substrate and an insulating or semi-insulating thin film is formed on the electrode. A semiconductor layer is formed on the insulating or semi-insulating film. A second insulating or semi-insulating thin film is formed on the semiconductor layer. A second electrode is formed on the second insulating or semi-insulating thin film.
Pref. the first electrode comprises a transparent electrically conductive layer of SnO2, Sb2O3 or In2O3, or an oxidation- resisting metal layer of **Pt**, W, **Au**, Mo, W, Ti, Cr or **Ni**. The second electrode comprises a metal layer of Al, Mg, Be or Ba. The insulating film consists of SiO2, SiC, Si3N4, alumina or zirconia. The semi-insulating film consists of SiO2-x where x is less than 1 but above 0 Si3N4-x (where x is below 3 but above 0) or SiCx (where x is above 0 and below 1). The semiconductor layer consists of amorphous Si.

L18 ANSWER 27 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1981-32686D [19] WPIX
TI Highly indium doped silicon semiconductor prodn. - using metal alloy contg. indium to reduce vapour pressure, useful for **opto electronic** device and IR sensor.
DC L03 U11
IN BAUR, B; SCHINK, N
PA (SIEI) SIEMENS AG
CYC 1
PI DE 2939491 A 19810430 (198119)*
PRAI DE 1979-2939491 19790928
AB DE 2939491 A UPAB: 19930915
Prodn. of highly In-doped Si (I) with semiconductor properties involves doping a Si rod or bar with a metal alloy contg. In. Pref. doping is carried out by noncrucible zone melting, using an alloy of In (1 **pt**.) with **Sn** (3 **pts**.), Ag (5 **pts**.), **Au** (3 **pts**.), or Si (9 **pts**.). The In concn. in the Si is 10 exp. 19 or 10 exp. 20 In atoms/cm3. Doping is carried out with a suitable moulding, e.g. a die or cylinder, placed at the starting point of zone melting or at continuous or discrete points along the rod.
(I) is specified for use in the prodn. of **optoelectronic** devices and IR sensors. The vapour pressure of the In is greatly reduced, allowing a much higher level of doping than usual to be attained.

L18 ANSWER 28 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1981-29178D [17] WPIX
TI Semiconducting highly thallium-doped silicon prodn. - by doping with thallium alloy to reduce thallium vapour pressure.
DC L03 U11 U12
IN SCHINK, N
PA (SIEI) SIEMENS AG
CYC 1
PI DE 2939542 A 19810416 (198117)*
PRAI DE 1979-2939542 19790928
AB DE 2939542 A UPAB: 19930915
In the prodn. of semiconducting, highly Tl-doped Si (I), a Si rod or bar

is doped with a metallic alloy (II) contg. Tl. (II) is pref. an alloy of Tl (1 **pt**.) with **Au** (4 **pts**.), Ag (4 **pts**.) or **Sn** (3 **pts**.). Tl is incorporated in a concn. of ca. 10 exp. 18 or 10 exp. 19 Tl atoms/cm3. Doping is carried out by noncrucible zone melting, using a (II) moulding, e.g. wafer, which is placed at the start of the rod to be zone melted or applied to continuous or discrete positions on the rod, to give a uniform Tl distribution.

(I) is specified for making **opto-electronic** devices and IR sensors. The use of (II) as dopant greatly reduces the Tl vapour pressure and hence considerably increases the possible Tl concn.

L18 ANSWER 29 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1981-29177D [17] WPIX
TI Semiconducting highly antimony-doped silicon prodn. - by doping with antimony alloy to reduce antimony vapour pressure.
DC L03 U11 U12
IN SCHINK, N
PA (SIEI) SIEMENS AG
CYC 1
PI DE 2939541 A 19810416 (198117)*
PRAI DE 1979-2939541 19790928
AB DE 2939541 A UPAB: 19930915
In the prodn. of semiconducting, highly Sb-doped Si (I), a Si rod or bar is doped with a metallic alloy (II) contg. Sb. (II) is pref. an alloy of Sb (1 wt.**pt**.) with **Au** (4 **pts**.), Ag (4 **pts**.), **Sn** (3 **pts**.) or Si (5 **pts**.). Sb is incorporated in a concn. of ca. 10 exp. 19 to 10 esp. 20 Sb atoms/cm3. Doping is carried out by noncrucible zone melting, using a (II) moulding, e.g. wafer, which is placed at the start of the rod to be zone melted or applied to continuous or discrete positions on the rod, to give a uniform Sb distribution.

(I) is specified for making **opto-electronic** devices and IR sensors. The use of (II) as dopant greatly reduces the Sb vapour pressure and hence considerably increases the possible Sb concn.

L18 ANSWER 30 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1981-29174D [17] WPIX
TI Semiconducting highly indium doped silicon prodn. - by doping melt with indium alloy to reduce indium vapour pressure and drawing.
DC L03 U11 U12
IN SCHINK, N
PA (SIEI) SIEMENS AG
CYC 1
PI DE 2939492 A 19810416 (198117)*
PRAI DE 1979-2939492 19790928
AB DE 2939492 A UPAB: 19930915
Prodn. of semiconducting, highly In-doped Si (I) entails first producing a metallic alloy (II) contg. In, then fusing this with Si in a crucible and drawing a highly doped Si rod or bar from this. Pref. (II) is an alloy of In (1 **pt**.) with **Au** (3 **pts**.), Ag (5 **pts**.), **Sn** (3 **pts**.) or Si (9 **pts**.). In is incorporated in a concn. of ca. 10 exp. 19 or 10 exp. 20 In atoms/cm3. Ar under slight over-pressure is used as protective gas.

(I) is specified for making **opto-electronic** devices and IR sensors. The use of (II) as dopant greatly reduces the In vapour pressure and hence increases the possible In concn.

L18 ANSWER 31 OF 36 WPIX (C) 2002 THOMSON DERWENT

AN 1981-29173D [17] WPIX
TI Semiconducting highly thallium doped silicon prodn. - by doping melt with thallium alloy to reduce thallium vapour pressure and drawing.
DC L03 U11 U12
IN SCHINK, N
PA (SIEI) SIEMENS AG
CYC 1
PI DE 2939460 A 19810416 (198117)*
PRAI DE 1979-2939460 19790928
AB DE 2939460 A UPAB: 19930915
Prodn. of semiconducting, highly Tl-doped Si (I) entails first producing a metallic alloy (II) contg. Tl, then fusing this with Si in a crucible and drawing a highly doped Si rod or bar from this. Pref. (II) is an alloy of Tl (1 wt.**pt**.) with **Au** (4 **pts**.), Ag (4 **pts**.) or **Sn** (3 **pts**.). Tl is incorporated in a concn. of ca. 10 exp. 18 or 10 exp. 19 Tl atoms/cm3. Ar under slight over-pressure is used as protective gas.
(I) is specified for making **opto-electronic** devices and IR sensors. The use of (II) as dopant greatly reduces the Tl vapour pressure and hence considerably increases the possible Tl concn.

L18 ANSWER 32 OF 36 WPIX (C) 2002 THOMSON DERWENT
AN 1981-29172D [17] WPIX
TI Semiconducting highly antimony doped silicon prodn. - by doping melt with antimony alloy to reduce antimony vapour pressure and drawing.
DC L03 U11 U12
IN SCHINK, N
PA (SIEI) SIEMENS AG
CYC 1
PI DE 2939459 A 19810416 (198117)*
PRAI DE 1979-2939459 19790928
AB DE 2939459 A UPAB: 19930915
Prodn. of semiconducting, highly Sb-doped Si (I) entails first producing a metallic alloy (II) contg. Sb, then fusing this with Si in a crucible and drawing a highly doped Si rod or bar from this. Pref. (II) is an alloy of Sb (1 wt.**pt**.) with **Au** (4 **pts**.), **Sn** (3 **pts**.) or Si (5 **pts**.). In (sic.; Sb) is incorporated in a concn. of ca. 10 esp. 19 or 10 exp. 20 Sb atoms/cm3. Ar under slight over-pressure is used as protective gas.
(I) is specified for making **opto-electronic** devices and IR sensors. The use of (II) as dopant greatly reduces the Sb vapour pressure and hence considerably increases the possible Sb concn.

L18 ANSWER 33 OF 36 JAPIO COPYRIGHT 2002 JPO
AN 1989-106467 JAPIO
TI IMAGE SENSOR
IN KUWANO YUKINORI; MORI NORIAKI; NAKANO SHOICHI; NOGUCHI SHIGERU; WATANABE KANEO; UEHARA HISAO; KOBAYASHI MITSUGI
PA SANYO ELECTRIC CO LTD, JP (CO 000188)
PI JP 01106467 A 19890424 Heisei
AI JP1987-264380 (JP62264380 Heisei) 19871020
SO PATENT ABSTRACTS OF JAPAN, Unexamined Applications, Section: E, Sect. No. 798, Vol. 13, No. 346, P. 136 (19890803)
AB PURPOSE: To simplify a manufacture process and reduce a cost by a method wherein an image read part composed of an optoelectric transducer and a display function of read images are provided in one substrate and the same semiconductor material and conductive material are employed for both the optoelectric transducer and the active element of the display function.
CONSTITUTION: A thin film 7 of semiconductor material such as amorphous

semiconductor whose main component is Si is sandwiched between a transparent electrode 8 made of indium oxide, **tin** oxide or the like and an electrode 9 made of metal such as Al, Ti, Cr, **Ni**, Ag or **Au** to form an example of an image read part 3. On the other hand, an image display part may be, for instance, a liquid crystal display of an active matrix driven by an active element 10 employing a thin film transistor. When the thin film transistor is employed, the material of the transparent electrode 12 of the picture element is the same as the material of the transparent electrode 8 of the image reading part 3, the material of the semiconductor layer 11 of the thin film transistor is the same as the material of the thin semiconductor film 7 of the image read part 3 and, further, the material of source and drain electrodes 13 and 14 is the same as the material of the light shielding electrode 9. With this constitution, as the same material can be applied in the same process, the manufacturing process can be simplified and the cost can be reduced.

L18 ANSWER 34 OF 36 JAPIO COPYRIGHT 2002 JPO
AN 1988-220568 JAPIO
TI PHOTOELECTRIC CONVERSION ELEMENT
IN ASHIDA YOSHINORI; FUKUDA NOBUHIRO; KOYAMA MASATO
PA MITSUI TOATSU CHEM INC, JP (CO 000312)
PI JP 63220568 A 19880913 Showa
AI JP1987-53056 (JP62053056 Showa) 19870310
SO PATENT ABSTRACTS OF JAPAN, Unexamined Applications, Section: E, Sect. No. 702, Vol. 13, No. 8, P. 124 (19890110)
AB PURPOSE: To obtain the characteristics of high photosensitivity by a method wherein a metal electrode, an intrinsic amorphous semiconductor thin film, an n-type semiconductor thin film and a transparent electrode are formed on a substrate in this order.
CONSTITUTION: A metal electrode, a substantially intrinsic amorphous semiconductor thin film, an n-type semiconductor thin film and a transparent electrode are formed on a substrate in this order. This metal electrode is a metal material which can form a rectification dam layer between itself and the amorphous semiconductor thin film to be formed subsequently to it; it is concretely chromium, **platinum**, **gold** or the like. The substantially intrinsic amorphous semiconductor thin film is amorphous silicon, containing bonded hydrogen, which has been formed on said metal electrode by a plasma decomposition method of a silane compound. The n-type semiconductor thin film is a thin film, displaying the n-type conductivity, which is formed by plasma decomposition of a mixed gas of the silane compound and phosphine PH2 or arsine AsH3; furthermore, the transparent electrode is concretely **tin** oxide, **tin** oxide-indium or the like. By this setup, the characteristics of photosensitivity can be improved.

L18 ANSWER 35 OF 36 JAPIO COPYRIGHT 2002 JPO
AN 1985-211972 JAPIO
TI OPTICAL INTEGRATED CIRCUIT
IN HASEGAWA KATSUYA
PA MATSUSHITA ELECTRIC IND CO LTD, JP (CO 000582)
PI JP 60211972 A 19851024 Showa
AI JP1984-69302 (JP59069302 Showa) 19840406
SO PATENT ABSTRACTS OF JAPAN, Unexamined Applications, Section: E, Sect. No. 387, Vol. 1, No. 61, P. 11 (19860311)
AB PURPOSE: To produce the titled optical integrated circuit with high speed and reliability subject to excellent controllability and more productivity by a method wherein photo element comprising InxGa1-xAsyP1-y polycrystalline epitaxial layer is provided on a semiinsulating InP substrate while an electric element comprising a junction type field

effect transistor (JFET) is formed on the exposed semiinsulating InP substrate other than the photo element part.
CONSTITUTION: An epitaxial layer N+ InGaAsP 12 to be a PIN photodiode, a nondope InP 13, another nondope InGaAs14 are liquid-grown on a semiinsulating **Fe** doped InP substrate 11. The InGaAsP layer 12 is partially exposed for making it feasible to lead out N side electrode of photodiode. An N type region 15 formed by means of dual implanting e.g. Si ion in the channel region of JFET as well as flash annealing process. Next a P type region to be a photoreceiving part 16' and a gate region 16 of FET is formed by means of implanting e.g. Zn ion as well as flash annealing process. An unified element of PIN photodiode and JFET may be produced by means of evaporating **Au/Sn** 17, 17', 18 as N type electrodes and **Au**/Zn 19, 19' as P type electrodes.

L18 ANSWER 36 OF 36 JAPIO COPYRIGHT 2002 JPO
AN 1983-164272 JAPIO
TI FORMING METHOD OF METAL PLATING LAYER ON METAL ELECTRODE
IN MORI KOJI; ITAGAKI MASAKUNI; ISHIWATARI TATSUMI; YOSHIDA TAIZO
PA RICOH CO LTD, JP (CO 000674)
PI JP 58164272 A 19830929 Showa
AI JP1982-46943 (JP57046943 Showa) 19820324
SO PATENT ABSTRACTS OF JAPAN, Unexamined Applications, Section: E, Sect. No. 218, Vol. 7, No. 2881, P. 62 (19831222)
AB PURPOSE: To simplify the work of forming a metal plating layer on a metal electrode and to enhance the efficiency by employing a transparent conductive film, from which the metal plating layer can be readily exfoliated, for plating leads, thereby easily removing the unnecessary plating layer adhered to the leads at the electrolytically plating time.
CONSTITUTION: A conductive film 2 made of SnO2, In2O3 or ITO is formed on a glass plate 1, and electrodes 3 made of **Ni**, NiCr, or NiCr-**Au** are selectively formed. Subsequently, a resist mask 4 is covered, plating lead wirings 5 are connected to the film 2, and **Au**, **Ni**, solder or **Sn** are selectively plated electrolytically at 6. After the mask 4 is removed, N2 gas is blown to remove unnecessary plating layer 6 adhered to the leads on the film 2. Since the film 2 of In2O3 or the like has large surface energy and small bonding strength with other metal in this case, the unnecessary part can be simply and readily exfoliated by blowing N2, the steps of forming the layer 6 can be efficiently performed and the cost can be largely reduced.

L20 ANSWER 1 OF 1 WPIX (C) 2002 THOMSON DERWENT
AN 1999-279396 [24] WPIX
DNN N1999-209497 DNC C1999-082249
TI Method for achieving **kinetically** controlled **solder** bond.
DC L03 M23 P55 U11 U12 V08 X24
IN COULT, D G; DERKITS, G E; OSENBACH, J W; WONG, Y
PA (LUCE) LUCENT TECHNOLOGIES INC
CYC 27
PI EP 911111 A2 19990428 (199924)* EN 16p
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI
JP 11192581 A 19990721 (199939) 11p
US 5990560 A 19991123 (200002)
ADT EP 911111 A2 EP 1998-308345 19981013; JP 11192581 A JP 1998-296665 19981019; US 5990560 A US 1997-955686 19971022
PRAI US 1997-955686 19971022
AB EP 911111 A UPAB: 19990719

NOVELTY - The heating the **solder** layer to a temperature above the solidus line of the **solder** layer so the **solder** layer is softened and dissolves the control layer to allow quenching layer to interact with the **solder** layer, so that quenching layer increases eutectic temperature of the **solder** layer and causes the **solder** layer to solidify, hence bonding the 1st member to 2nd member.

DETAILED DESCRIPTION - **Solder** bonding for securing 1st member to 2nd member comprises providing **soldering** structure disposed between 1st and 2nd members, where the structure comprises **solder** layer having a thickness, a quenching layer having a thickness and compsn. that when the quench layer interacts with **solder** layer, the **quench** layer increases eutectic temp. of the **solder** layer, and control layer. The control layer comprises Pt and has thickness of one-fifth or less relative to the thickness of either the **solder** layer or **quenching** layer. One member is a laser chip, the other is a sub-optical assembly. The **solder** layer comprises layers fabricated with metals selected from Au, Sn, and Pb, and quenching layer is a unitary layer fabricated with a metal from Au and Pb.

USE - For **solder** bonding for parts bonding of laser chips to optical sub-assemblies.

ADVANTAGE - Greater control is achieved over the reaction rates and bonding process, and improved bonds are formed remaining solid at temps. above the mpt of the original **solder** compsn..

DESCRIPTION OF DRAWING(S) - The figure shows a cross-section of a structure for **solder** bonding.

Dwg.1/6

L22 ANSWER 1 OF 3 WPIX (C) 2002 THOMSON DERWENT
AN 1991-254943 [35] WPIX
DNN N1991-194402 DNC C1991-110588
TI Explosive weapon e.g. bomb - has casing made with fragile zone to fracture at raised temp. and spill contents, reducing risk of explosion.
DC K03 Q79
IN COUTURIER, G; WINAVER, A
PA (THOH) THOMSON-BRANDT ARME; (THOH) THOMSON BRANDT ARMEMENTS
CYC 5
PI FR 2656085 A 19910621 (199135)*
SE 8803610 A 19910711 (199135)
GB 2242008 A 19910918 (199138)
DE 3834754 A 19911121 (199148)
GB 2242008 B 19920115 (199203)
IT 1235718 B 19920924 (199312)
ADT FR 2656085 A FR 1987-14099 19871013; GB 2242008 A GB 1988-23816 19881011; DE 3834754 A DE 1988-3834754 19881012; IT 1235718 B IT 1988-67860 19880928
PRAI FR 1987-14099 19871013
AB FR 2656085 A UPAB: 19930928
An explosive weapon, e.g. a bomb, consists of a casing (10) contg. the explosive material (12), filled e.g. through an aperture covered by a flange (11) at the back. One **pt**. of the weapon's casing is made with a zone of reduced strength, so that in the event of a rise in temp. the casing will split and spill its contents rather than explode. The reduced strength zone can be made by having the rear section (13) of the casing made separately from the rest and attached to it by a **brazed** joint which melts at a temperature below that at which the bomb explodes. The explosive material used in the weapon is one which incorporates a flexible binding agent, e.g. rubber-based.
ADVANTAGE - Reduced risk of explosion, e.g. in event of fire.
1/7

L22 ANSWER 2 OF 3 WPIX (C) 2002 THOMSON DERWENT
AN 1984-134745 [22] WPIX
DNN N1984-099805 DNC C1984-056884
TI Slender ballistic missile has ductile nose and body - with brittle section between all connected at butt joints and pref. contg. tungsten or depleted uranium.
DC K03 Q79
IN BECKER, W; BISPING, B
PA (RHEM) RHEINMETALL GMBH
CYC 10
PI DE 3242591 A 19840524 (198422)* 9p
EP 111712 A 19840627 (198426) DE
R: BE DE FR GB IT NL SE
AU 8321151 A 19840524 (198428)
CA 1216467 A 19870113 (198707)
EP 111712 B 19881109 (198845) DE
R: BE DE FR GB IT NL SE
DE 3378424 G 19881215 (198851)
US 4872409 A 19891010 (198950)
ADT DE 3242591 A DE 1982-3242591 19821118; EP 111712 A EP 1983-111016 19831104; US 4872409 A US 1987-185240 19870817
PRAI DE 1982-3242591 19821118; DE 1983-3339078 19831028
AB DE 3242591 A UPAB: 19930925
A sub-calibre ballistic missile having a high length/ diameter ratio has a main section or body composed of a ductile material with its density increased by a high proportion of tungsten or depleted uranium.

Between this main body and the nose, there is an intermediate section, of a macroscopically homogeneous material of comparatively high brittleness. All these three parts are connected together at butt joints.
The intermediate component may be a sintered alloy having a high content of tungsten or depleted uranium. The length of this intermediate component is pref. at least one and one half times its maximum diameter. The joints may be made by hard **soldering** or diffusion sintering.
0/2

L22 ANSWER 3 OF 3 WPIX (C) 2002 THOMSON DERWENT
AN 1982-P6502E [45] WPIX
TI Enclosed relay design using flat fixed-terminal contacts - is constructed of ferro-**nickel** or copper alloy with planar contacting area to absorb shock.
DC V03
IN HOLVOET, G; LEGRAND, J; POUYEZ, P
PA (SOCX) SOCAPEX
CYC 1
PI FR 2502388 A 19820924 (198245)* 9p
PRAI FR 1981-5661 19810320
AB FR 2502388 A UPAB: 19930915
The relay consists of an arrangement of two fixed magnetic electrical contacts (44,45) positioned either side of a movable magnetic relay blade (6). The blade bends to make contact with one of the fixed terminals whenever a current pulse is applied to the magnetic polarising coils (15).
The fixed terminal posts (4,10) enter the hermetically sealed enclosure through glass-bead seals (13,12). Flat ferro-**nickel** strips (44,45), of thickness between 0.05 and 0.45 mm, are **soldered** vertically to the post stubs. This gives certain amount of flexibility to the terminal under impact from the blade which helps absorb the **kinetic** energy and reduce contact bounce.
Non-magnetic tips (61,62) are fixed to the ends of the terminals.
3/3

L27 ANSWER 1 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 2002-237387 [29] WPIX
DNN N2002-182656
TI Screen printing apparatus for printing cream **solder** onto substrate, forces out **solder** from printing space portion so as to print on substrate through mask plate.
DC P42 P74 P75 U11 X24
IN ABE, S; MIYAHARA, S; TOMOMATSU, M; YAMASAKI, K
PA (MATU) MATSUSHITA ELECTRIC IND CO LTD; (MATU) MATSUSHITA DENKI SANGYO KK; (ABES-I) ABE S; (MIYA-I) MIYAHARA S; (TOMO-I) TOMOMATSU M; (YAMA-I) YAMASAKI K
CYC 3
PI US 2001023645 A1 20010927 (200229)* 12p
GB 2361106 A 20011010 (200229)
JP 2001225443 A 20010821 (200229) 6p
ADT US 2001023645 A1 US 2001-781546 20010213; GB 2361106 A GB 2001-3873 20010216; JP 2001225443 A JP 2000-39574 20000217
PRAI JP 2000-39574 20000217
AB US2001023645 A UPAB: 20020508
NOVELTY - A pressure plate pressurizes a cream **solder** stored in a storage section, and forces the paste out into a printing space portion through a transfer passage, while a squeegee head (13) slides on a mask plate (12). The **solder** forced out from the printing space portion, is printed on a substrate (6) through the mask plate.
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for screen printing method.
USE - For printing cream **solder**, conductive paste on substrate, during mounting of electronic components on substrate.
ADVANTAGE - Enables accurate printing of paste on the substrate in accordance with the shape of the pattern formed in the mask plate, and hence printing quality is improved. Reduces the **kinetic** viscosity of the **solder** while passing through the transfer passage. Flow ability of the **solder** is improved and so high pressure is not needed to fill the **solder** on the pattern holes of substrate and prevents the leakage of **solder**.
DESCRIPTION OF DRAWING(S) - The figure shows a side view of screen printing apparatus.
Substrate 6
Mask plate 12
Squeegee head 13
Dwg.1/3

L27 ANSWER 2 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 2000-451799 [39] WPIX
DNN N2000-336414 DNC C2000-137561
TI Uncured and unreinforced film for adhering **soldered** chips to printed board comprises polymeric or polymer forming matrix material, curing agent soluble in matrix material and inert filler.
DC A32 A85 E13 L03 P73 U11 V04
IN KLAPPROT, D K
PA (DEXC) DEXTER CORP
CYC 84
PI WO 2000034032 A1 20000615 (200039)* EN 47p
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW NL OA PT SD SE SL SZ TZ UG ZW
W: AL AM AT AU AZ BA BB BG BR BY CA CH CN CU CZ DE DK EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT

UA UG UZ VN YU ZW
AU 2000021651 A 20000626 (200045)
ADT WO 2000034032 A1 WO 1999-US28768 19991207; AU 2000021651 A AU 2000-21651 19991207
FDT AU 2000021651 A Based on WO 200034032
PRAI US 1998-207316 19981207
AB WO 200034032 A UPAB: 20000818

NOVELTY - An uncured and unreinforced film (I) comprises 0.5-50% of a polymeric or polymer forming matrix material, 0.01-10% of a curing agent that is soluble in the matrix material at a temperature less than 100 deg. C, by weight of the film and 50-80% of a substantially spherical and inert filler that has a maximum particle size less than 30 mu m, by volume of the film.

DETAILED DESCRIPTION - The uncured and unreinforced film possesses the following physical and **kinetic** characteristics:

(i) a smooth, uninterrupted surface;

(ii) a uniform thickness of 5 mils or less with a deviation of plus or minus 0.5 mils or less and a Cpk higher than 1.0;

(iii) a viscosity of at least 50,000 poise at room temperature;

(iv) sufficiently low tack to permit die-cutting and machine placement;

(v) sufficient flexibility to be handled without breaking; (iv) an activation energy no greater than 300 KJ/mol, and the ability to retain more than 50% of its theoretical heat of reaction when tested at a heating rate of 200 deg. C/min.

INDEPENDENT CLAIMS are also included for the following:

(1) a cured film (II) formed by curing (I), wherein the cured film is void free, has a coefficient of thermal expansion (CTE) between 20 and 25 ppm/ deg. C, has an isotropic modulus, fracture strength, CTE and thermal conductivity, and has a thermal cycle resistance sufficient to withstand more than 2,000 thermal cycles;

(2) a process for furthering the adhesion between a chip and a printed board and simultaneously, filling the separation between them comprising:

(a) providing (I);

(b) die cutting film to obtain a cut film that is smaller than the chip to be bonded and thicker than the final separation between the **soldered** chip and the printed board;

(c) mechanically placing cut film between two or more bonding lands on the printed board or, alternatively, mechanically placing cut film between two or more input/output points on the surface of the chip;

(d) attaching **solder** bumps onto the input/output points on the surface of the chip;

(e) positioning the chip next to the printed board so that the cut film lies between the chip and the printed board and the **solder** bumps on the chip align with the bonding lands on the printed board;

(f) applying heat and/or pressure sufficient to cause the **solder** to fully descend onto the bonding lands and form **solder** joints and, simultaneously, cause the uncured film to flow around and between the **solder** joints and cure, thereby, creating a cured film that aids the adhesion of the **soldered** chip to the printed board and simultaneously filling the separation between the chip and the printed board; and

(3) an assembly comprising a printed board, a chip and (II) that adheres the chip to the printed board and completely fills the separation between the chip and the printed board.

USE - Useful in adhering and underfilling **soldered** chips to a printed board.

ADVANTAGE - The time required to underfill a chip is greatly reduced

by using solid films that can be placed between the chip and the printed board.
DESCRIPTION OF DRAWING(S) - The figure shows the underfilling process.
Dwg.1/5

L27 ANSWER 3 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 2000-364716 [31] WPIX
CR 2002-163008 [04]; 2002-236637 [06]
DNN N2000-272954
TI **Solder** balls mounting apparatus for forming ball grid array package, comprises controller connected to porous base for selectively causing air to pass through holes and base.
DC P55 U11
IN MAY, J; PROVENCHER, T J
PA (MAYJ-I) MAY J; (PROV-I) PROVENCHER T J
CYC 82
PI WO 2000022667 A1 20000420 (200031)* EN 42p
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW NL OA PT SD SE SL SZ TZ UG ZW
W: AL AM AT AU AZ BA BB BG BR BY CA CH CN CU CZ DE DK EE ES FI GB GE GH GM HU ID IL IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT UA UG US UZ VN YU ZW
AU 9965124 A 20000501 (200036)
ADT WO 2000022667 A1 WO 1999-US23527 19991009; AU 9965124 A AU 1999-65124 19991009
FDT AU 9965124 A Based on WO 200022667
PRAI US 1998-169851 19981009
AB WO 200022667 A UPAB: 20020508
NOVELTY - The first plane of a porous carbon base (56) contacts the plane (60) of a template. A controller (70) is connected to the base, for selectively causing the air to pass through the holes and base along a predefined direction to force the **solder** balls into the holes.
DETAILED DESCRIPTION - Several holes of diameters slightly larger than the **solder** ball diameter are formed such that they are orthogonally pass through planes (48,60) of the metallic template (46) corresponding to the pattern. The backing surface is formed in contact with a selected portion of the second plane of a porous carbon base. A sealed cavity is defined between the second plane of the base and the backing surface. The controller is coupled to the cavity. The magnet is arranged opposing the base w.r.t. the template for magnetically attracting the plane (60) of the template towards the first plane of base.
An INDEPENDENT CLAIM is also included for **solder** ball mounting method.
USE - For mounting **solder** balls in a predefined pattern on a substrate for the formation of ball grid array packages used in various electronic devices such as telephones, televisions, personal computers, cellular phones, pagers, video camcorders and audio visual products.
ADVANTAGE - **Solder** balls are mounted on substrate reliably and quickly without requiring use of gravity to provide for ball motion. Since magnet is arranged opposing to base with respect to template for magnetically attracting one of planes of template towards first plane of base, desired contact condition of template and first plane of base is maintained reliably. The air flow is reversed by the controller, thereby pushes the **solder** balls from holes out of template, thereby reduces **kinetic** energy of **solder** balls after it is captured in the hole.
DESCRIPTION OF DRAWING(S) - The figure shows a sectional view of the

solder ball mounting apparatus.
Metallic template 46
Planes of metallic template 48,60
Porous carbon base 56
Controller 70
Dwg.3/8

L27 ANSWER 4 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 2000-341644 [30] WPIX
DNN N2000-256669 DNC C2000-103820
TI **Solder** bonding of parts, e.g. for optoelectronic and electronic hybrid integrated circuits, comprises applying chemical element layer of an intermetallic compound to first and second parts.
DC L03 P55 X24
IN ANGST, D L; AUKER, B S; COULT, D G; DERKITS, G E; OSENBACH, J W
PA (LUCE) LUCENT TECHNOLOGIES INC; (ANGS-I) ANGST D L; (AUKE-I) AUKER B S; (COUL-I) COULT D G; (DERK-I) DERKITS G E; (OSEN-I) OSENBACH J W; (AGER-N) AGERE SYSTEMS GUARDIAN CORP
CYC 27
PI EP 1002612 A1 20000524 (200030)* EN 10p
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI
JP 2000210767 A 20000802 (200041) 7p
US 6342442 B1 20020129 (200210)
US 2002045330 A1 20020418 (200228)
ADT EP 1002612 A1 EP 1999-308915 19991109; JP 2000210767 A JP 1999-331303 19991122; US 6342442 B1 US 1998-197074 19981120; US 2002045330 A1 Div ex US 1998-197074 19981120, US 2001-21174 20011029
PRAI US 1998-197074 19981120; US 2001-21174 20011029
AB EP 1002612 A UPAB: 20000624
NOVELTY - **Kinetically** controlled **solder** bonding of parts comprises applying chemical element layer of an intermetallic compound to first and second parts, joining and heating the parts.

DETAILED DESCRIPTION - Bonding parts together comprises:

(a) applying at least a first chemical element layer of an intermetallic compound to a first part;

(b) applying at least a second chemical element layer of the intermetallic compound to a second part;

(c) placing the second part on the first part so that the chemical element layers contact each other; (d) heating the parts from a storage temperature to a bonding temperature which is slightly above a first melting temperature that melts the chemical element layer of one of the first and second parts into a liquid mixture having a composition that varies with time during heating due to the formation of the intermetallic compound by progressive incorporation of the other one of the first and second chemical element layers into the mixture; the first melting temperature of the liquid mixture increasing with time as the composition changes until the melting temperature of the liquid mixture is about equal to the bonding temperature thereby solidifying the liquid mixture; and

(e) holding the parts at a temperature which is higher than the storage temperature to maintain diffusion of the other one of the first and second chemical element layers into the bond thereby forming a quantity of the intermetallic compound in the bond which raises the melting temperature of the bond to a desired usage temperature that is above the first melting temperature.

INDEPENDENT CLAIMs are also included for (1) a hybrid optoelectronic circuit, (2) a **solder** useful in **kinetically** controlled bonding of parts.

USE - **Solder** bonding, for **kinetically** controlled

solder bonding of parts, for the bonding of multiple components to a single substrate such as those used in optoelectronic and electronic hybrid integrated circuits, for telecommunication systems.

ADVANTAGE - The method reduces or eliminates the problem of **solder** remelting during subsequent processing of the bonded parts. The melting temperature of the bond is still low enough, however, to enable debonding of the parts for failure analysis or circuit repair without damaging them.

DESCRIPTION OF DRAWING(S) - The drawing illustrates the method for bonding the parts according to the invention.

Parts 10,16

Chemical element layers 12a-12d

Solder 14

Dwg.1A/4

L27 ANSWER 5 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 2000-059624 [05] WPIX
DNN N2000-046849
TI Mounting procedure for semiconductor integrated circuit packaging - involves loading particle on bonding sheet which is moved by **kinetic** energy supplied by mechanical device.
DC P55 U11
IN HOTCHKISS, G B; LESSARD, R J
PA (TEXI) TEXAS INSTR INC
CYC 2
PI JP 11317414 A 19991116 (200005)* 52p
US 6204094 B1 20010320 (200118)
ADT JP 11317414 A JP 1999-65382 19990204; US 6204094 B1 Provisional US 1998-73614P 19980204, US 1999-241714 19990202
PRAI US 1998-73614P 19980204; US 1999-241714 19990202
AB JP 11317414 A UPAB: 20000128
NOVELTY - A particle (12) such as **solder** or polymer is loaded on a bonding sheet. The particle is moved by the **kinetic** energy supplied by a mechanical device. DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for mounting apparatus for semiconductor IC packaging.

USE - For semiconductor integrated circuit (IC) packaging.

ADVANTAGE - Mounts **solder** or polymer on bonding sheet which has several bonding areas. DESCRIPTION OF DRAWING(S) - The figure shows the top view of semiconductor wafer for semiconductor IC packaging. (12) Particle.

Dwg.1/10

L27 ANSWER 6 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 1997-226322 [20] WPIX
DNN N1997-187165 DNC C1997-072614
TI Spin stabilised projectile - having front and rear body parts joined near rear end, and metal alloy band **soldered** or **brazed** onto cylindrical surface.
DC K03 Q79
IN NILSSON, Y
PA (FOER-N) FOERSVARETS FORSKNINGSANSTALT; (FOER-N) FOERSVARETS FORSKNINGS
CYC 24
PI WO 9713113 A1 19970410 (199720)* EN 11p
RW: AT BE CH DE DK ES FI FR GB GR IE IT LU MC NL PT SE
W: CN IL JP KR SG US
SE 9503423 A 19970404 (199726)
SE 505232 C2 19970721 (199735)
ZA 9608328 A 19970730 (199735) 9p

```
     EP 850395     A1 19980701 (199830)   EN
         R: DE ES FR GB IT
     CN 1202963     A   19981223 (199919)
     JP 11513474    W   19991116 (200005)       10p
     US 6085662     A   20000711 (200037)
     KR 99063968    A   19990726 (200044)
ADT  WO 9713113 A1 WO 1996-SE1258 19961003; SE 9503423 A SE 1995-3423 19951003;
     SE 505232 C2 SE 1995-3423 19951003; ZA 9608328 A ZA 1996-8328 19961003; EP
     850395 A1 EP 1996-933716 19961003, WO 1996-SE1258 19961003; CN 1202963 A
     CN 1996-198470 19961003; JP 11513474 W WO 1996-SE1258 19961003, JP
     1997-514208 19961003; US 6085662 A WO 1996-SE1258 19961003, US 1998-51196
     19980403; KR 99063968 A WO 1996-SE1258 19961003, KR 1998-702442 19980403
FDT  EP 850395 A1 Based on WO 9713113; JP 11513474 W Based on WO 9713113; US
     6085662 A Based on WO 9713113; KR 99063968 A Based on WO 9713113
PRAI SE 1995-3423       19951003
AB   WO    9713113 A UPAB: 19970516
```

A spin-stabilised projectile has front (1) and rear (2)body parts joined (3) near the rear end, and a metal alloy band (4) **soldered** or **brazed** by its inner surface and front edge onto a cylindrical surface (6) and front shoulder (5) formed circumferentially at the rear end of the front part so that the band can be slipped on. The joint is pref. a threaded or overlap joint, and is located inside the band. The rear part pref. has a forwardly directed shoulder (12) which abuts the band rear edge and which has an o.d. equal to that of the first shoulder. The rear end of the front part is pref. level with the rear end of the band.

USE - Suitable for **kinetic** energy projectiles fired at higher trajectory and spinning speed.

ADVANTAGE - Provides more secure fixing of the band.

Dwg.1/2

```
L27  ANSWER 7 OF 24  WPIX (C) 2002 THOMSON DERWENT
AN   1993-274946 [35]    WPIX
DNN  N1993-211154        DNC C1993-122575
TI   Gas blow-torch head for welding, brazing, etc. - comprises
     visual observation device and pressure cleaning system.
DC   M23 Q73
IN   DONZE, M
PA   (DONZ-I) DONZE M
CYC  1
PI   FR 2684434     A1 19930604 (199335)*      14p
ADT  FR 2684434 A1 FR 1991-14944 19911203
PRAI FR 1991-14944      19911203
AB   FR    2684434 A UPAB: 19931119
```

A gas blowtorch head of the type comprising a nozzle body equipped internally with an optical device for visual observation. The nozzle body (101) has a circuit for the jection of fluid emerging at the level of one or more associated outlets (11,111.1,111.2) and allowing the directing of fluid with a high **kinetic** energy onto the working and/or insepction surface (S) in order to clean the surface by the mechanical action of the fluid. the outlets (111,111.1,111.2) are essentially circular and are arranged around a principla outlet (103) of the nozzle body (101) with an angular distribution. The optical device for visual observation (120) comprises an optical fibre (105) at the end of which is lens (106) coaxial to the main outlet (103) of the nozzle body (101) and the circuit for the jection of fluid is arranged to concentrate the fluid essentially in the zone of vision swept by the lens (106) of the optical fibre (105).

USE/ADVANTAGE - The gas blowtorch head is used in blowtorches for

dressing operations (notably using oxy-acetylene), welding or bazing (by oxy-**brazing** for example) or cutting (oxy-cutting for example).
It enable direct observation of the molten metal bath during the welding operation and improves the abiliity to detect defects. It can also be used for the insepction of component surfaces, including that of materials such as stone and granite that may be resistant to the action of a frame. It also provides the operator with the ability to clear the surface an any debris.
Dwg.1/2

L27 ANSWER 8 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 1993-256728 [32] WPIX
DNN N1993-197546
TI Strength testing of flat sample with stress concentrator in side face - applying uniform **solder** layer onto one flat surface of sample and monitoring crack formation **kinetics** on opposite surface.
DC S03
IN SEMENOV, V N; SIPYAGINA, L E; VASYUTIN, A N
PA (POWE-R) POWER EQUIP EXPER WKS
CYC 1
PI SU 1753347 A1 19920807 (199332)* 3p
ADT SU 1753347 A1 SU 1990-4777627 19900102
PRAI SU 1990-4777627 19900102
AB SU 1753347 A UPAB: 19931118
A test sample (1) is made with a notch (2), acting as a stress concentrator and as a place of development of a crack. **Solder** is placed in the gap between the lower surface of the sample (1) and a plate, which is fixed to the sample using wire (5) and the plate is made of material of the sample. The sample (1) is then heated up to the **soldering** temp and loaded, causing growth of a cracks.
The process of formation and growth of a crack is carried out until appearance of **solder** on the upper surface of the sample and recording of various sequential stages of the process of the crack is carried using photographing or filming.
USE/ADVANTAGE - For testing of strength properties of metal samples with stress concentrators. Better accuracy by taking into account effect of crack growth **kinetics**. Bul.29/7.8.92
Dwg.1/2

L27 ANSWER 9 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 1992-408879 [50] WPIX
DNN N1992-311845 DNC C1992-181350
TI Hydrogen -nitrogen gas plasma **soldering** method - in which the plasma is excited by radio frequency energy to simultaneously clean and heat the **solder** without the need of other heat sources.
DC L03 M23 P55 V04 X24
IN FIORENZO, R T; FREI, J K
PA (MOTI) MOTOROLA INC
CYC 5
PI EP 517430 A1 19921209 (199250)* EN 7p
R: DE FR GB
US 5223691 A 19930629 (199327) 7p
JP 05177343 A 19930720 (199333) 8p
EP 517430 B1 19950906 (199540) EN 8p
R: DE FR GB
DE 69204557 E 19951012 (199546)
ADT EP 517430 A1 EP 1992-304873 19920528; US 5223691 A US 1991-709673 19910603; JP 05177343 A JP 1992-166730 19920603; EP 517430 B1 EP 1992-304873 19920528; DE 69204557 E DE 1992-604557 19920528, EP

1992-304873 19920528
FDT DE 69204557 E Based on EP 517430
PRAI US 1991-709673 19910603
AB EP 517430 A UPAB: 19931116
A plasma based **soldering** method comprising the steps of (i) depositing **solder** at a junction of first and second surfaces being adjacent each other; (ii) placing the surfaces and **solder** in a chamber; (iii) evacuating the chamber to a low pressure; (iv) providing a plasma within the chamber which uses a hydrogen-nitrogen gas mixt.; (v) energising the plasma between first and second electrodes by applying a radio frequency energy source connected across the electrodes, producing excited plasma ions; (vi) simultaneously cleaning the surfaces and **solder** with the plasma; (vii) heating the **solder** with the plasma; and (viii) reflowing the **solder** on the surfaces to form a **solder** bond therebetween.

The cleaning step comprises (i) bombarding the surfaces and **solder** with the ions; (ii) absorbing the ions into the surface oxide layers of the surfaces and **solder**; (iii) reacting the ions with the oxide layers creating reaction prods.; and (iv) desorbing the reaction prods. to improve wetting of the **solder** on the surfaces upon the **solder** reflow.

USE/ADVANTAGE - Provides a method for plasma based **soldering** which leaves no contaminating compound on the surfaces or **solder** to be absorbed into the **solder** during reflow and requires no heat sources other than the plasma.
1/2
Dwg.1/2

L27 ANSWER 10 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 1989-194078 [27] WPIX
DNN N1989-148452 DNC C1989-085767
TI Ceramic composite used as armour plate - contg. aluminium nitride as interconnected fine grains mixed with silicon carbide, boron carbide or titanium di boride.
DC A32 A95 L02 M13 P73 Q79
IN ABBASCHIAN, C J; BARNES, A L; CLERE, T M; WHEELER, D J
PA (ELTE) ELTECH SYSTEMS CORP
CYC 14
PI EP 322719 A 19890705 (198927)* EN 8p
R: AT BE CH DE ES FR GB GR IT LI LU NL SE
US 4876941 A 19891031 (199002) 6p
ADT EP 322719 A EP 1988-121319 19881220; US 4876941 A US 1987-140077 19871231
PRAI US 1987-140077 19871231
AB EP 322719 A UPAB: 19930923
Armour plate composite, opt. layered with metal or plastic substrate, comprises fine, interconnected grains of TiN mixed with one or more of SiC, B4C or TiB2. The surface layer pref. contains 10-90 wt.% TiB2 and balance AlN. The prepn. is pref. by hot pressing, HIP or pressureless sintering - density is at least 95% theoretical and grain size is less than 5 micron. Structure pref. comprises reaction prod. of each of TiB2 and AlN mixed with TiB2, AlN, SiC, B4C or mixts. thereof as filler which can be in fibre or woven form.

Composite is prepd. from mixt. of particulate reactants which is heated through stages of: (1) raising at moderate rate of pref. 10-100 or esp. over 15 deg.C/min. to within 50-600 deg.C of peritectic decomposition temp., (2) heating at lower rate of pref. 0.1-10 and esp. less than 8 deg.C until through decomposition temp. and (3) heating at substantial rate to max. reaction temp.

ADVANTAGE - Plate has enhanced resistance to high **kinetic**

energy projectiles.
0/0

L27 ANSWER 11 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 1987-349061 [50] WPIX
DNN N1987-261623 DNC C1987-149125
TI Soft **solder** coating small workpieces - by coating with colophonium soln. then dripping **solder** drops onto the surface.
DC A97 M23 P55 X24
IN GUTHER, V; ROHR, A
PA (KERH) VEB KERAMISCHE WERKE HERMSDORF
CYC 1
PI DD 248073 A 19870729 (198750)* 2p
ADT DD 248073 A DD 1986-289286 19860417
PRAI DD 1986-289286 19860417
AB DD 248073 A UPAB: 19930922
Workpieces are coated with a soft **solder** by dripping a definite soln. of Colophonium onto the surface to be coated followed by dripping **solder** from a certain height onto the surface. The expansion of the dripped **solder** over the surface results from the **kinetic** energy of the drops and the shape of the surface.
USE/ADVANTAGE - Esp. for **solder** coating small workpieces. As the workpieces do not have to be heated, they are not thermally stressed and energy loss is avoided.
0/0

L27 ANSWER 12 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 1987-015453 [03] WPIX
DNN N1987-011501
TI Spiral compressor with near-isothermic compression - has 0.1-0.5 mm thick spiral partitions defining spiral ducts only few mm wide to further increase efficiency over main patent.
DC Q51 Q52 Q56
IN ECKERT, M; HAMMER, M
PA (GRON-I) GRONERT H
CYC 1
PI DE 3525136 A 19870115 (198703)* 4p
DE 3546779 A 19900222 (199009)
DE 3525136 C 19900613 (199024)
DE 3546779 C 19910529 (199122)
ADT DE 3525136 A DE 1985-3525136 19850713; DE 3546779 A DE 1985-3546779 19850713
PRAI DE 1984-408633 19850713; DE 1985-3525136 19850713; DE 1985-3546779 19850713
AB DE 3525136 A UPAB: 19930922
The spiral compressor for gas or vapour operates isothermically to maximise efficiency, i.e. by reducing power absorbed theoretically by 25-30% with 8-12 compression ratio as compared with adiabatic compression, expected practical power gain being 10-25%.
In the compressor the spiral ducts are defined by spiral partitions consisting of thin, e.g. 0.1-0.5 mm thick, rigid elements spaced at a few millimetres only. These elements are secured by adhesive or **soldering** to form rigid light-weight assemblies, and act as effective heat transfer surfaces to further approach the ideal isothermic operation.
ADVANTAGE - Further improvement of efficiency (and of recovery of energy from cooling water) in spiral compressor of the type specified in the main patent.
0/0

L27 ANSWER 13 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 1984-114682 [19] WPIX
DNN N1984-084718 DNC C1984-048277
TI **Soldering** process with metered **solder** supply - esp. for mass prodn. **soldering** of electric lamps.
DC L03 M23 P55 X26
PA (KREB-I) KREBS D
CYC 1
PI DD 205837 A 19840111 (198419)* 13p
ADT DD 205837 A DD 1982-242178 19820802
PRAI DD 1982-242178 19820802
AB DD 205837 A UPAB: 19930925
The required amt. of molten **solder** is dispensed from a **solder** source, heated to well above the **solder** melting point under an inert gas atmos., and is fed by gravity and opt. additionally by **kinetic** energy supplied by **solder** feeders and/or inert qas pressure to the **soldering** region, while the cold or preheated **soldering** region is heated to the **soldering** temp.

The process is esp. useful in mass prodn. **soldering** e.g. of electric lamps. The **solder** is accurately metered, **soldering** is rapid (less than 1 sec.), oxidn. is avoided, and inexpensive lead **solders** with relatively low tin content can be used.
0/1

L27 ANSWER 14 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 1984-067121 [11] WPIX
DNN N1984-050442 DNC C1984-028971
TI Large unit **brazing** appts. - has centrifugal fan in upper part of sealing tube.
DC M23 P55
PA (KORO-I) KOROTKOV V P
CYC 1
PI SU 1016099 A 19830507 (198411)* 2p
ADT SU 1016099 A SU 1982-3389470 19820204
PRAI SU 1982-3389470 19820204
AB SU 1016099 A UPAB: 19930925
The device comprises a **solder** bar consisting of a sealed tube (1) with a capillary porous insert (2) inside it impregnated with a volatile liquid heat carrier and having an axial channel (3), a centrifugal fan (6) being located in the upper part of the sealed tube. The capillary porous tube is mounted with a gap (5) relative to the internal surface of sealed tube. The inlet hole (7) of the fan is connected to the axial channel (3), and the outlet hole (8) to the annular gap.

The device is useful in the **brazing** of very large units, and depends for its action on conversion of the **kinetic** energy of the gaseous mixt. into heat in porous insert (2) because of the high hydrodynamic resistance of its walls. Bul. 17/7.5.83.
1/1

L27 ANSWER 15 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 1977-D9374Y [19] WPIX
TI Low induction rotor for pulse generator - is formed by insulated lamination discs interconnected on perimeter.
DC X11
PA (KHAR-I) KHARITONOV V V

CYC 1
PI SU 525206 A 19761105 (197719)*
PRAI SU 1975-2098866 19750120
AB SU 525206 A UPAB: 19930901
Low induction cylindrical rotor for unipolar impulsing machine is used for generation of powerful magnetic field by conversion of **kinetic** energy of rotating mass. It consists of an assembly of discs insulated from one another and from the rotating shaft. To improve energy conversion characteristic, by reduction of induction, the insulating discs are connected electrically along the perimeter.

The rotor consists of discs mounted on a shaft and insulated from the shaft and from one another by epoxy impregnated glass cloth. The perimeter of the discs is electrically interconnected by **brazing** in grooves. Current collectro rings mounted on end discs use liquid metal.

When rotated in uniform radial magnetic field, EMF is generated in the rotor and by connecting rings to load current flows on the perimeter of the rotor.

The design is suitable for construction of impulsing machines with large diameter rotor of simple design and large current output. By selection of suitable thickness of discs and of radial dimension of peripheral zone, the machine produces low magnetic linkage inside the rotor and low induction.

L27 ANSWER 16 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 1976-95772X [51] WPIX
TI Hardmetal tip **brazing** machine for disc saws - has screw and nut feed shaft and jaw clamp lever and rod press, system with tool carriage guided on adjustable plate.
DC M23 P55
PA (BEKI) BELORUSS KIROV TECHN INS
CYC 1
PI SU 503680 A 19760408 (197651)*
PRAI SU 1974-1985842 19740103
AB SU 503680 A UPAB: 19930901
Hardmetal tip **brazing** machine for tools, e.g. disc saw teeth arming, has a resistance heater for the **brazing** action, tool or saw disc clamp, drive and current feed. The disc is fed lengthways by a combination of shaped nut and lead screw **kinetically** linked to the drive. Parallel to the screw is a fixed shaft with a clamping system for the disc made of side jaws. The feed movement stems from a cylinder coupled to the shaft side jaw and a shaped lever. One arm of the lever is hinged to the cylinder rod and the second fixed to the disc clamp. The **brazing** tool can be traversed or moved up and down by an insulated body on the main stand together with a bearing plate which in its turn rides up and down the body to achieve **brazing** tool adjustments. This sits in a travelling carriage guided along on the plate.

L27 ANSWER 17 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 1976-66122X [35] WPIX
TI Condenser **brazing** and tinning facility - small bath in large bath on sprung post responds to two-arm lever link for filling.
DC M23 P55
PA (NSRA-R) NOVOS RADIO COMPONE
CYC 1
PI SU 484943 A 19760106 (197635)*
PRAI SU 1973-1914446 19730503
AB SU 484943 A UPAB: 19930901
Brazing and tinning condensers by tank dip for use in the radio

and electronics sector is carried out by means of an indexer disc with magazines, flux bath, large tank with **solder** on a vertical base and a small bath of **solder** which is placed within the tank on a sprung post. Scrapers are supplied to clean the surface and similarly a two arm lever which is **kinetically** linked by one of its two arms to the smaller of the two **solder** baths. For more reliable function, the tank and small bath are on a common up and down base. The magazine has a channel and outlets which supply coolant to the work and are also fitted with a comb type clamp. This can move both ways in the horizontal plane.

L27 ANSWER 18 OF 24 WPIX (C) 2002 THOMSON DERWENT
AN 1975-68409W [41] WPIX
TI Ultrasonic quality test **soldered** joint - with thermal monitor for observation of process **kinetics**.
DC M23 S03
PA (PANC-I) PANCHENKO P V
CYC 1
PI SU 459721 A 19750324 (197541)*
PRAI SU 1972-1798653 19720615
AB SU 459721 A UPAB: 19930831
Quality control test method for **soldering** process is based on application of periodic ultrasonic pulses through the joint and recording of amplitude of transmitted signal. To obtain insight into the **kinetics** of the process, the monitoring equipment includes temp. recorder with a sensor near the joint. Rise of temp. to melting point of the **solder** proceeds in accordance with curve. formation of joint is indicated by a sharp rise of amplitude of ultrasonic signal. After cooling, point determines the end crystallization cycle after which the amplitude of ultrasonic signal.

L27 ANSWER 19 OF 24 JAPIO COPYRIGHT 2002 JPO
AN 2000-236001 JAPIO
TI INTERCONNECTING STRUCTURE OF FLIP-CHIP SEMICONDUCTOR, INTERPOSER AND ITS FORMING METHOD, AND ASSEMBLING METHOD OF ELECTRONIC MODULE
IN JOSEPH A BENENATTI; WILLIAM T CHEN; LISA A FANTI; WAYNE JOHN HOWEL; KNICKERBOCKER JOHN U
PA INTERNATL BUSINESS MACH CORP <IBM>
PI JP 2000236001 A 20000829 Heisei
AI JP2000-005442 (JP2000005442 Heisei) 20000114
PRAI US 1999-233388 19990119
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2000
AB PROBLEM TO BE SOLVED: To reduce thermo-**kinetic** fatigue to a minimum in a flip-chip package.
SOLUTION: An interposer 400 used for mounting a flip-chip is made of an organic polymer which includes an aperture 33, having a conductive plug 433 and selected in a such way that an optimum length between a substrate and a chip with a coefficient of thermal expansion in matching with the extremum of a thermal cycle temperate of the module component can be obtained. The conductive plug 433 is made of a high-temperature **solder** 40, provided in an inside of the aperture 33 and a low-temperature **solder** 45 provided to the outer side of the high-temperature **solder** 40. Then, a low-- temperature **solder** 45 is subjected to reflow, while the high-temperature **solder** becomes solid.
COPYRIGHT: (C)2000,JPO

L27 ANSWER 20 OF 24 JAPIO COPYRIGHT 2002 JPO
AN 1999-317414 JAPIO

TI METHOD FOR MOUNTING CONDUCTIVE PARTICLE ON SUBSTRATE AND DEVICE THEREOF
IN GREGORY B HOTCHKISS; ROBERT J LESSER
PA TEXAS INSTR INC <TI>
PI JP 11317414 A 19991116 Heisei
AI JP1999-065382 (JP11065382 Heisei) 19990204
PRAI US 1998-73614 19980204
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 99
AB PROBLEM TO BE SOLVED: To provide a method for assembling an electronic device by moving particles on an adhesive sheet having plural adhesive areas.
SOLUTION: This method comprises a step for loading particles on an adhesive sheet, and a step for moving particles by transferring **kinetic** energy from a mechanical device to the particles. The adhesive sheet may be composed of an adhesive coating laminated to a film. The particles can be constituted of various kinds of materials, including **solder** or polymer inorganic and compounds.
COPYRIGHT: (C)1999,JPO

L27 ANSWER 21 OF 24 JAPIO COPYRIGHT 2002 JPO
AN 1998-075050 JAPIO
TI HAND CLEANER UTILIZING **KINETIC** ENERGY
IN TERAYAMA HISANORI
PA TERAYAMA HISANORI, JP (IN)
PI JP 10075050 A 19980317 Heisei
AI JP1996-228177 (JP08228177 Heisei) 19960829
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 98, No. 3
AB PURPOSE: TO BE SOLVED:To provide a hand cleaner with improved operating efficiency, capable of **soldering** and sucking up of **solder** while being held in one hand.
CONSTITUTION: ron part 1 and a heater part 2 are provided for fusing **solder**; a coil spring (non-linear) 3 and a piston 4 are provided for sucking up the **solder**; a lock-stopper 5, a lock-pin 6, an unlock button 7, and a spring stopper 8, etc., are provided for controlling the coil spring 3; an aluminum rod 9, a **solder** stopper 10, a **solder** grounds receiving region 11 are provided for receiving the sucked up **solder** refuse; and a slide-type superposed member 12, a guide shaft 13 for guiding the moving the superposed member, a fixed shaft 14, and a guide rail 15 are provided.

L27 ANSWER 22 OF 24 JAPIO COPYRIGHT 2002 JPO
AN 1995-106482 JAPIO
TI LEAD FRAME, SEMICONDUCTOR DEVICE, AND METHOD AND APPARATUS FOR MANUFACTURE OF LEAD FRAME DEVICE
IN TADA NOBUHIKO; OGATA KOJIRO
PA HITACHI CONSTR MACH CO LTD, JP (CO 351479)
PI JP 07106482 A 19950421 Heisei
AI JP1993-247040 (JP05247040 Heisei) 19931001
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 95, No. 4
AB PURPOSE: To provide a lead frame free from surface irregularities due to dross and spatter so as to improve its adhesion to semiconductor chips and a printed- circuit board for surface mounting.
CONSTITUTION: A metal sheet 100 is worked by a laser machining apparatus 108 to form a lead frame 100a. The surface of the lead frame 100a is mechanically treated by the **kinetic** energy of a fine granular substance 11 which spouted from a shot blast apparatus 110, so that spatter and dross caused by laser machining are removed. In succession to this, the lead frame is chemically treated by an electrolytic polishing

apparatus 120, many fine flaws and uneven parts which have been formed by the shot blast apparatus 100 are dissolved and removed, and the surface of the lead frame 100a is cleaned smoothly. After that, a **solder** plating treatment is executed in a **solder** plating tank 122.

L27 ANSWER 23 OF 24 JAPIO COPYRIGHT 2002 JPO
AN 1995-091898 JAPIO
TI MISSILE
IN NAKAGAWA ICHIROU
PA NISSAN MOTOR CO LTD, JP (CO 000399)
PI JP 07091898 A 19950407 Heisei
AI JP1993-235157 (JP05235157 Heisei) 19930921
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 95, No. 4
AB PURPOSE: To provide a missile in which a **kinetic** energy can be kept or increased during its flying operation and the missile can positively pass through a target.
CONSTITUTION: This missile is provided with a ram jet combustion device 10 having an air intake port 11 at its hollow head part and having a ram nozzle 12 at its tail end, a penetrator 2 arranged within the ram jet combustion device 10 and having a solid fuel 3 fixed therein, and a strat 5 for supporting the penetrator 2 on an axis of the ram jet combustion device 10. The penetrator 2 and the strut 5 are connected through a silver **brazing** part 6 which is melted in response to a completion of combustion of the solid fuel 3 with an air flow of high temperature flowing from the air inlet port 11 and compressed.

L27 ANSWER 24 OF 24 JAPIO COPYRIGHT 2002 JPO
AN 1990-290907 JAPIO
TI METHOD AND APPARATUS FOR MANUFACTURING **SOLDER** FINE POWDER
IN KIYAMA AKIO; HIROSE YOICHI; YOSHIMURA RYOICHI
PA SHOWA DENKO KK, JP (CO 000200)
PI JP 02290907 A 19901130 Heisei
AI JP1989-110887 (JP01110887 Heisei) 19890428
SO PATENT ABSTRACTS OF JAPAN, Unexamined Applications, Section: M, Sect. No. 1081, Vol. 15, No. 61, P. 89 (19910213)
AB PURPOSE: To prevent roughening of surface of the part of a rotary body in contact with molten metal by using the specific high m.p. metal of W, Mo, etc., for the part in the rotary body in contact with the molten metal at the time of manufacturing the powder with rotary disk atomizing method.
CONSTITUTION: **Solder** is melted in a crucible 1 and molten metal 4 is dropped on the rotary body 3 rotating at high velocity of several thousands - several ten thousands rpm from a nozzle 2 at bottom part of the crucible and **kinetic** energy of the rotary body is imparted to the molten metal and the molten metal is splashed and pulverized with the centrifugal force. In this way, at the time of manufacturing the **solder** fine powder, the high m.p. metal of one kind of W, Mo, Nb, Ta or Cr is used for the part in the rotary body 3 in contact with the molten metal 4. This metal may be machined into the rotary body as raw material as it is and in other way, the surface of the rotary body made of easy-to-machine metal of stainless steel, etc., may be covered with the above metal by plasma thermal spraying method, etc. By this method, reaction of the rotary body 3 with the molten metal 4 can be suppressed.